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Final

Tongue River, Montana Petition Evaluation Document

82-4-228 SUMRA and
522 SMCRA Evaluation
DSL/OSM-PE-2

February 1982

Prepared by the
Montana Department of State Lands and the
U.S. Office of Surface Mining Reclamation and Enforcement
in cooperation with the U.S. Geological Survey and
the Montana Bureau of Mines and Geology

James R. Harris, Director
Office of Surface Mining
Reclamation and Enforcement

Gareth C. Moon, Commissioner
Montana Department of State Lands

COVER SHEET

A. TITLE OF DOCUMENT

Tongue River, Montana, Petition Evaluation Document

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The final document supplements the draft document.

C. ABSTRACT

The Northern Plains Resource Council filed the Tongue River petition on December 29, 1980, with both the Montana Department of State Lands (DSL) and the Office of Surface Mining Reclamation and Enforcement (OSM). The petition alleges (1) that the area is nonreclaimable and (2) that surface coal mining could result in substantial loss or reduction of long-range productivity of renewable resource lands, including water supply and food products, in the affected area.

This evaluation document presents an updated analysis of the draft document and presents comments and responses to the draft.

The area extends from 1 mile west of Wall Creek (south of Birney) to 1 mile north of Beaver Creek (near Brandenberg) along the Tongue River, and southeast along Otter Creek to 2½ miles south of Fifteenmile Creek. The approximately 194,650-acre petition area is bounded on the east and on the south by Custer National Forest and on the west by the Northern Cheyenne Indian Reservation.

The various alternatives analyzed include: (1) designating the area as unsuitable for coal mining; (2) not designating the area as unsuitable for coal mining; or (3) restricting types and methods of mining to those which would assure reclaimability or would assure no loss of or reduction in the long-range productivity of renewable resource lands. The latter would include designating as unsuitable areas where local impacts on the ground water and alluvial water would result in the long-term loss of or reduction in productivity of water supply and of food or fiber products.

This document was jointly prepared by DSL and OSM. A final decision on this petition is required by December 21, 1981.

SUMMARY

A. BRIEF EXPLANATION OF THE PETITION PROCESS

Those criteria for assessing unsuitability for surface coal mining operations provided by the Montana Strip and Underground Mine Reclamation Act (SUMRA), Section 82-4-228(2) MCA, and by the Surface Mining Control and Reclamation Act (SMCRA), Sections 522(a)(3)(B) and 522(c), include nonreclaimability, incompatibility with existing land use plans, potential damage to fragile or historic lands, substantial loss of or reduction in long-range productivity of water supply or food or fiber products, and mining on hazardous lands which could endanger life or property.

B. DESCRIPTION OF THE TONGUE RIVER PETITION

Events.--The Tongue River petition was originally submitted November 26, 1980, to both the Montana Department of State Lands (DSL) and the Office of Surface Mining Reclamation and Enforcement (OSM). Technically, the petition submitted to both agencies was identical; however, two separate land areas, one Federal and one State, and therefore two separate suitability decisions are involved. This original petition was formally rejected by DSL and OSM on December 19, 1980. The reasons for rejection included (1) failure to provide evidence which tended to establish that saline and sodic conditions extend throughout the petition area and (2) discrepancies between the map submitted and the legal description identifying the petition area. The Tongue River petition was refiled with DSL and OSM on December 29, 1980, and was determined to be complete on January 19, 1981. Public hearings on the petition and the draft evaluation document were held October 21 and 22, 1981, in Ashland, Montana; the final decisions on the petition will be made in December 1981.

Issues.--The major allegations of both the State and Federal petitions are:

(1) The area affected by surface coal mining operations could not be reclaimed in accordance w[illegible] the requirements of the act (i.e., the soils are too thin and salty to be reclaimed successfully); and

(2) Surface coal mining operations in the affected area would result in a substantial loss or reduction of long-range productivity of the water supply and of food and fiber products (i.e., the cumulative impact of mining on water would be serious, permanent, and deleterious).

C. DEFINITION OF STATE AND FEDERAL ACTION

The Commissioner, Montana Department of State Lands, for private and State lands, and the Director, Office of Surface Mining, for Federal lands, are required to make decisions on the Tongue River petition by December 21, 1981. (Note: As part of ongoing regulatory review, OSM intends to propose revised regulations for the Designation of Unsuitability process (30 CFR, Parts 760-769). The State regulatory authority (DSL) may also be afforded the opportunity to modify its rules accordingly. These regulatory changes will not affect this petition, which has been processed according to current State and Federal

regulations.) In the event that the Commissioner and the Director disagree as to the decision, each would make the final decision for non-Federal and Federal lands, respectively. The several alternatives available to them range from designating all lands in the entire petition area as unsuitable for all or certain types of surface mining operations, to not designating any of the lands in the area as unsuitable. The decisionmakers also have the option of designating only parts of the area as unsuitable for all or certain types of surface coal mining operations. The action alternatives are as follows:

- o Designation that the entire petition area is unsuitable for surface coal mining operations.--No new permits for coal mining that would affect the surface could be issued in the area designated, and the area would be withdrawn from Federal coal leasing.

- o Designation that none of the petition area is unsuitable for surface coal mining operations.--The normal State and Federal Lands Regulatory Programs would apply to surface coal mining activities. A determination to not designate any or all of the petition area as unsuitable does not mean that coal mining would necessarily occur. Coal mining operations could commence within the petition area only upon approval of a site-specific mine plan. Montana law allows DSL to selectively deny mining in certain critical, fragile, or unique areas after DSL has received an application to mine such areas. Montana law also requires a cumulative hydrologic assessment to be made of all anticipated mining prior to reaching a coal permit decision.

- o Conditional designation of unsuitability.--Decisions could also be made making partial designations of unsuitability, such as declaring certain types of coal mining as unsuitable, or certain locations as unsuitable, or a combination of both, as follows:

    - o Designate as unsuitable for all surface mining operations those parts of the petition area on which reclamation is not technologically and economically feasible.

    - o Impose conditions on future mining operations in order to protect the water resources of the Tongue River.

- o Designate the entire petition area as unsuitable for surface mining, but allow underground mining. This decision would be made provided that mining and related impacts do not result in significant surface disturbance.

D. PUBLIC RECORD

A public record is available at the DSL Offices: 1625 - 11th Avenue, Helena, Montana, and 1245 North 29th Avenue, Billings, Montana; and at the OSM Office: Brooks Towers, 1020 - 15th Street, Denver, Colorado. This record may be reviewed and any portion of it may be copied at a reasonable charge. Included in this record are the data specifically generated for this project, as well as the petition, supporting affidavits, interventions, petition-related documents, and the complete transcript of the public hearings held in Ashland, Montana.

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CHAPTER I

INTRODUCTION

This supplement, together with the draft evaluation document (hereinafter the "draft document") of September 1981, is the final environmental analysis and evaluation of the petition to designate certain lands in southeastern Montana (fig. I-1, draft document) as unsuitable for coal mining. The Northern Plains Resource Council and others submitted the "Tongue River petition" to the Montana Department of State Lands (DSL) and the U.S. Office of Surface Mining (OSM) on December 29, 1980. DSL/OSM have evaluated the petition in accordance with Section 82-4-228 MCA of the Montana Strip and Underground Mine Reclamation Act (SUMRA) and Section 522 of the Federal Surface Mining Control and Reclamation Act (SMCRA). They deemed the petition complete in January 1981, released a draft analysis September 16, 1981, and held public hearings October 21 and 22, 1981, in Ashland, Montana, in order to solicit additional information. The comment period on the draft document ended November 2, 1981. This supplement and the final decision will be made available to the public on December 21, 1981. Distribution to the public will follow as quickly as printing and mailing allow.

The draft document analyzes the allegations in the petition, discusses coal resources, and analyzes the supply and demand for these coal resources. This final supplement summarizes and responds to interventions and to the oral testimony presented at the public hearings; it also reproduces and responds to written comments on the draft document. Finally, it presents new information, and revises and amplifies parts of the draft, notably the analyses of the allegations. Information in the draft document is not reproduced in this final supplement, so it must be used in conjunction with the draft, and vice versa.

The final decision will:

- o designate all of the petition area as unsuitable for coal mining,
- o designate none of the area as unsuitable for coal mining, or
- o designate parts of the area as unsuitable, or designate conditions with which mining operations must comply.

It should be clearly understood that a decision to not designate all or any part of a petition area as unsuitable for all or certain types of surface mining operations would not mean that such lands are, conversely, determined as suitable. The designation process is not intended to usurp the land use planning, leasing, permitting, or mining plan requirements. Furthermore, DSL/OSM regulations allow for the filing of subsequent petitions based on the accrual of new information or on different allegations. Such a petition may be either (1) to designate the same or additional lands as unsuitable or (2) to terminate a previous designation of lands as unsuitable. Also, during land use planning, leasing, or mining permit review, certain areas may be identified and deleted from mining.

This document, as a supplemental volume to the draft document, contains the following chapters:

Chapter I, "Introduction," contains the general explanation of this final document. In addition, a brief discussion is provided for those areas of public concern which were not included in the petition's allegations.

Chapter II, "Changes from the Draft Document," contains the text revisions and supplemental analysis of the hydrology and soils and gives references to specific statements in the draft evaluation document, by chapter and page.

Chapter III, "Summary of Public Hearing Testimony, of Interventions, and of Responses to Both," contains the summation of and general responses to the oral testimony received at both public hearings as well as a summary of pertinent materials submitted by intervenors.

Chapter IV, "Written Comments and Reponses," contains the comment letters received and the DSL/OSM responses to those letters. Some responses refer the reader to the supplemental analysis in chapter II of this volume as reply to specific written comments.

Chapter V, "Alternative Actions," is reproduced in its entirety to ensure clarity and completeness.

Chapter VI, "Additional References," lists literature not previously cited in chapter VIII of the draft document.

A. CRITERIA FOR DESIGNATION

The designation of an area as unsuitable for mining may be mandatory or discretionary. The designation is mandatory if the agencies determine that legally required reclamation is not technologically and economically feasible (Section 82-4-228 MCA and Sections 522(a)(2) and (a)(3) of SMCRA). The designation is discretionary if mining would substantially reduce long-range productivity of water supply or of food or fiber products.

Thus, DSL and OSM must designate an area unsuitable for mining if they find that reclamation of the area would be technologically or economically unfeasible, as the petitioners allege. However, the agencies would have discretion to designate the area as unsuitable, if they make the threshold determination that substantial long-term damage to water supplies and food and fiber products would result (as the petitioners further allege). In exercising this discretionary option, the agencies could take into account the extent of potential damage, its cost, who would be affected by it, and other factors. For instance, coal resources and supply and demand reports (see chapter III of the draft document and this evaluation), which provide an understanding of the consequences that a decision to designate an area as unsuitable might have on the environment, the economy, and the supply of coal, give revelant information.

If the area is designated unsuitable, any person having an interest that is or may be adversely affected by that designation may petition the agencies to terminate the designation. Such a petition for termination must include:

1. the location and size of the area covered by the petition;

2. allegations of facts, with supporting evidence, not contained in the record of the proceeding in which the area was designated unsuitable, which would tend to establish the statements or allegations, and which statements or allegations indicate that the designation should be terminated based on:

    a. the nature or abundance of the protected resource or condition or other basis of the designation if the designation was based on criteria found in Section 82-4-228(2)(b) of SUMRA or Section 522(c) of SMCRA; or

    b. reclamation now being technologically and economically feasible if the designation was based on the criteria of Section 82-4-228(2)(a) of SUMRA or Section 522(c) of SMCRA; or

    c. the resources or condition not being affected by strip or underground coal mining operations, or in the case of land use plans, not being incompatible with strip or underground coal mining operations during and after mining, if the designation was based on the criteria of Section 82-4-228(2)(b) of SUMRA or Section 522(c) of SMCRA;

3. the petitioner's name, address, and telephone number; and

4. identification of the petitioner's interest which is or may be adversely affected by the continuation of the designation.

B. THE TONGUE RIVER RAILROAD

One major concern of those living in or adjacent to the petition area, which was not previously discussed in detail, is the Tongue River Railroad. Although it is beyond the scope of this document to address such concerns in any detail, the following general information is provided. The Interstate Commerce Commission (ICC) holds the authority to authorize the construction and operation of rail lines. As a part of this process, the ICC is required to write an environmental report in accordance with the National Environmental Policy Act (NEPA). The ICC is also responsible for seeing that impacts are kept to a minimum should the proposed railroad be authorized. DSL and OSM have no jurisdiction in authorizing the construction and operation of a railroad nor do any other State or Federal agencies. The Designation of Lands Unsuitable for Mining process allows only for an evaluation of potential coal mining impacts under those criteria identified in Sections 82-4-228 and 522 of the State and Federal acts, respectively. However, if the threshold determination of substantial loss of water supply and food and fiber products is made, the railroad may, legally, be considered in the decisionmakers' discretionary designation decision.

A draft environmental report on the Tongue River Railroad is expected to be completed by spring of 1982 and released for public review. The proposed Tongue River Railroad is expected to have an average right-of-way width of 150 to 200 feet. The proposed length, including a short spur up Otter Creek, is approximately 89 miles. As such, approximately 1,800 acres could be taken directly out of agricultural production. Some of this would be uplands, some would be bottom land. The railroad would probably bisect many of the productive fields along the

river, indirectly affecting several hundred acres more. The contractor for the environmental analysis has interviewed most, if not all, of the ranchers along the proposed right-of-way, and the environmental analysis is expected to go into detail on the loss of agricultural production. The impacts, both positive and negative, and various alternatives, will be discussed by the ICC in its report. Designation of the petition area as unsuitable could have the effect of precluding coal mine development south of Beaver Creek (see figure II-1 of the draft document). What effect an unsuitability designation would have on the area north of Beaver Creek is unclear, in that so much of the surrounding region is underlain by coal. Should you have any questions regarding the proposed railroad, they should be directed to:

Carole Dawkins
Interstate Commerce Commission
Office of Policy and Analysis
Room 5380
Washington, D. C. 20423

telephone: (202) 275-7658 (commercial)
FTS 275-7658

C. ECONOMIC FEASIBILITY OF RECLAMATION

The petitioners allege that reclamation within the petition area is both technologically and economically infeasible. In addition, considerable public concern was expressed at the public hearing and in writing regarding a broad range of economic issues. Specific concerns related to the economics of mining and reclamation include the costs associated with chemical quality and Btu content of petition area coal, the coal stripping ratios within the petition area, the cost of special handling certain material, and the lack of an existing coal transportation network.

By law, DSL and OSM must analyze the allegation that reclamation in the petition area is economically unfeasible. If they decide that the allegation is correct, they must designate the area as unsuitable for mining.

The only reclamation cost estimates available for the petition area are those for Montco's proposed mine on King Creek south of Ashland. Montco's permit application estimates that cost at approximately $23,000 per acre. In contrast, NERCO's permit application for the Spring Creek mine near Decker, Montana (which DSL permitted in April 1979), estimated the reclamation costs to be about $16,000 per acre. The cost estimates for reclaiming these mines differ because of differences in the production processes and the associated economies of size; differences in management intensity and effectiveness; differences in stripping ratios; differences in the equipment used; differences in the amount of material rehandling required for both mining and reclamation; and the time at which the estimates were made.

Special handling of spoil material to minimize surface reclamation problems may contribute to the total reclamation cost for an operation. Special handling techniques for certain materials within the petition area will probably be necessary. Without detailed data and site-specific mine plans, DSL and OSM have no definitive way to evaluate possible increased reclamation costs directly attributable to special material handling activities. However, the cost of special

handling techniques are generally small relative to other production costs. For example, Montco estimates total reclamation costs for their proposed mine to be approximately 35 cents per ton (or about 2.5 percent of the FOB price; DSL environmental impact statement team, oral communication, 1981). This value includes estimated costs for special material handling techniques. The percentage of the delivered price of the coal attributable to special handling is even less. It should also be noted that special handling can be reduced where the requirements can be integrated into the development of mining and reclamation plans.

Special handling of material is not an uncommon reclamation practice. The Peabody mine to the northwest of the petition area, for example, is currently using special handling techniques for selected spoils in accordance with permit require ments imposed by DSL. The two Decker mines to the south of the petition area have agreed to special handling techniques in certain areas. Both the Decker and the Peabody Coal Companies are successfully marketing coals from their mines.

Stripping ratios are another mining and reclamation cost factor that are used by a company when it considers specific areas to be mined. Stripping ratios vary throughout the petition area due to changing thicknesses of the overburden and recoverable coal seam. The economic stripping ratio also varies from mine to mine, but the USGS standard used in the Powder River Basin for determining economic mining limits is an overall stripping ratio of 6.5 to 1. Mining companies may adjust their operation by going to a lower stripping ratio in response to differing production cost activities such as special handling of material. Figure III-1 of the draft document and the associated text show that only those petition-area resources with a maximum stripping ratio of 6.5 to 1 were considered as being economical to mine, all other factors being equal. It should be noted that Montco's average overburden stripping ratio for their North King mining unit is 3:1 (loose cubic yards:ton), which is considered well within this economical recoverable limit.

Coal quality is an important marketability factor as it relates directly to transportation costs and boiler design. Although 8,300 Btu/lb appears to be a "typical" heat content for the petition area, coal of a higher or lower Btu may be mined on a site-specific basis. Companies plan their mining operation such that only those coals with a Btu sufficient to be marketed will be mined. The operator may use coal blending to maximize coal recovery and to attain the desired Btu content for delivered coal. The analysis data do not support the allegation that petition area coal could not also be marketed, when evaluated solely on the basis of heat content. Coal data from mine applications on file with the DSL list Btu values different from those shown in Mr. Boulding's table 1 of the Northern Plains Resource Council letter. (See table I-1.)

Available data on coal quality (table I-1) from Montana coal mine permit applications indicate that petition area coal is similar to other area coals now being marketed. Furthermore, boilers can be (and frequently are) designed to burn coal of a particular quality and thus, it follows that boilers could be designed or modified to handle the petition area coal. Additional comments regarding the marketability of petition area coal and coal quality may be found in response number 59 to the written comments submitted by the Northern Plains Resource Council.

Several commentors allege that the nonexistent railroad transportation network within the petition area should make the marketing cost of Montco or other petition area coal prohibitive. Most new mines need to develop rail spurs.

Table I-1.--Average coal quality (as received)[1] at several Montana mines

Mine	Percentage sulfur	Percentage ash	Btu/lb	Sodium (as Na_2O)[2]
Big Sky[3]	1.01	9.09	8,360	([4])
Spring Creek[3]	.33 - .38	3.63 - 3.66	9,407 - 9,508	7.84
West Decker[3]	.33 - .38	3.73 - 5.25	9,262 - 9,553	5.5
North Decker[3]	.42 - .42	4.13 - 5.15	9,345 - 9,733	.9 - 2.33
Rosebud, Area C[3]	.87	9.57	8,348	.31
Montco[3]	.32 - 1.02	5.33 - 9.05	8,560 - 9,185	3.23
EMRIA (Otter Creek/ Knobloch, Flowers Goodale)	.15 - .46	5.5 - 8.2	8,110	3.86 - 5.05
SW Otter tract	.3	3.9	8,194	([5])
NW Otter tract	.2	6.2	8,497	([5])
Coal Wood/Cook Mountain	.2	4.7	8,836	([5])
Ashland Decker Birney	.2	5.4	8,354	([5])

[1]Average if one seam, range if more than one.
[2]As a percent weight ignited base.
[3]Data for the mines are taken directly from the mine permit applications. Data from EMRIA and the lease areas are taken from the BLM's published studies.
[4]Data are submitted by the company.
[5]No data provided in tract profiles.

For example, the Colstrip spur is about 25 miles long, the Westmoreland spur about 36 miles, and the Decker spur about 19 miles. Spurs have also been developed throughout the Powder River Basin coal area of Wyoming. The proposed Tongue River railroad has the potential to service several mines both within and outside the petition area (e.g., Foster Creek, Pumpkin Creek, Otter Creek, and so forth), and it is difficult to assess what proportion of rail charges paid by Montco would be attributable to the initial cost of the railroad. It has been reported that a minimum of 17 to 30 million tons per year would be necessary to support the railroad. The evidence does not indicate that all of this tonnage must come from the petition area.

Transportation costs are only a part of the total delivered price of coal to the consumer. The coal market determines the demand for a particular coal in light of substitutable coals from other producing regions nationwide. Consumers minimize total delivered costs per heating unit (Btu) rather than transportation cost per ton of coal. The reported estimated construction cost of 150 million dollars for the Tongue River Railroad amortized over the available coal in the region is relatively small as compared to the approximately 3.5 billion tons of potentially minable coal within the petition area alone.

In summary, DSL/OSM's analysis of the economics of reclamation in the petition area, which includes analysis of information provided during the comment period and at the public hearings, does not demonstrate that coal mine reclamation costs within the petition area would be economically unfeasible.

CHAPTER II

SUMMARY OF CHANGES TO, AND REVISIONS IN, THE DRAFT DOCUMENT

This supplement contains (a) corrections and additions to specific portions of the draft document as a result of internal review, and (b) revisions, chapter by chapter, based on final analysis. Comments are responded to in one of two ways: either (a) as text change or (b) directly, where no text change resulted. Where several comments on the same issue were raised a general response may appear in the text revision. Thus, duplication is kept to a minimum.

A. REVISIONS TO CHAPTER II OF THE DRAFT DOCUMENT

Figure II-1 of this document should be used in conjunction with pages II-5 through II-13 and table II-4 of the draft document.

The paragraph below should be added to the end of the discussion on "Social, Economic, and Community Services Background," page II-16 of the draft document:

> "If coal is produced from the petition area, the local and State economies would be affected by the associated development. The expanded tax base, increased employment, and associated revenues might be a major positive impact to the area. However, this impact must be balanced against the cost of providing services in support of growth. The Montana Department of State Lands (DSL) is currently conducting an in-depth analysis for the environmental impact statement on the proposed Montco mine, and the Interstate Commerce Commission (ICC) is doing a similar analysis for the proposed railroad.

B. REVISIONS TO CHAPTER III OF THE DRAFT DOCUMENT

Page III-13, paragraph 1, sentence 2: add Bernknopf (1980) as a reference. The complete reference is:

> Bernknopf, R. L., 1980, Domestic coal distribution--An interregional programming model of the U.S. coal industry: Washington, D.C., George Washington University, unpublished Ph. D. dissertation.

C. CORRECTIONS TO CHAPTER IV, HYDROLOGY, OF THE DRAFT DOCUMENT

The water quality of the Tongue River is classified as B-2 (B-2e was an erroneous reference number, not a different classification). See page IV-2 of the draft document.

D. REVISIONS TO CHAPTER IV, HYDROLOGY, OF THE DRAFT DOCUMENT

The following discussions clarify and revise the analyses of the draft document.

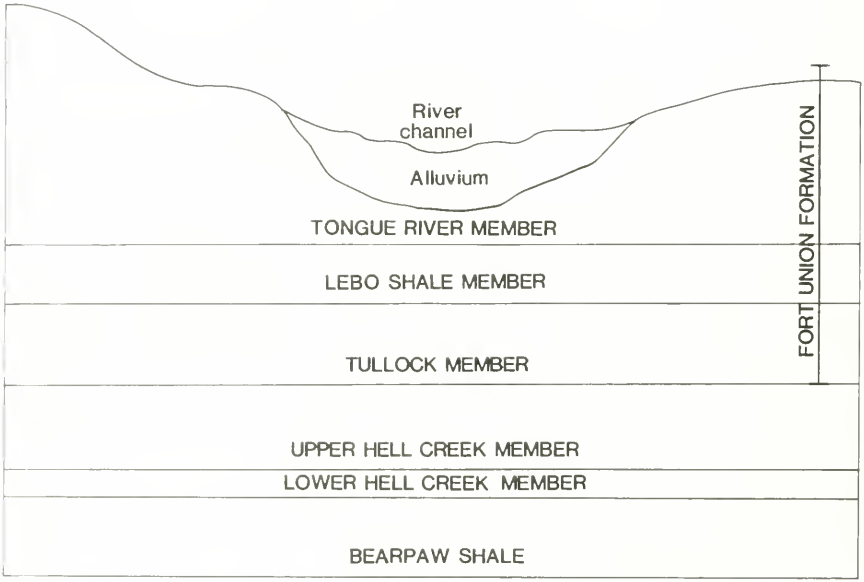

Figure II-1.--Idealized cross-section in the Tongue River area. The aquifer characteristics of each are presented in table II-4 of the draft document; all are aquifers. Depth varies from zero to several hundred feet in any given place. Impacts from mining would only occur to the waters of alluvium and the Tongue River Member, both of which contain several wells. (See tables II-5 and II-6 of the draft document.)

1. Modeling

Modeling was used in an attempt to project the future impact of mining. The models used in this analysis were chosen because they made use of available data and were developed specifically for the Tongue River Basin.

a. USGS water-quality model

DSL and the Office of Surface Mining (OSM) chose to use a predictive model, developed by Paul F. Woods of the U.S. Geological Survey (Woods, 1981), to evaluate water quality in the Tongue River basin. The model was accepted by the Director of the Survey and results were published following intensive peer review. This model was chosen because it (1) provides for monthly time steps for each yearly simulation, (2) covers the entire petition area, (3) allows for various simulations, including either the present or the proposed capacity of the Tongue River Dam, (4) allows for additional water withdrawals as an input, and (5) allows for irrigated acreage as an input.

This model simulates monthly changes in water quality (total dissolved solids (TDS) levels) and quantity (streamflow) in the Tongue River, between the dam and Miles City, and in its major tributaries Pumpkin, Otter, and Hanging Woman Creeks. The model algebraically accounts for losses and gains in streamflow and TDS within each stream reach, considering the leaching of water through spoils, as well as changes caused by various industrial and agricultural scenarios. The input variables for the model are (1) hydrologic conditions for each month, (2) TDS concentrations coming in from the Tongue River Reservoir, (3) number of irrigated acres, (4) number of mined acres, (5) TDS concentrations of mine leachates, and (6) quantification of other water losses.

The USGS water-quality model assumes:

- a routing interval of 1 month, although the actual routing interval is highly dependent on streamflow magnitude;
- that all coal mines in the petition area will discharge at a steady state rate for a long time period and that they will all be discharging to streams at some common, undetermined time in the future;
- that leachate from the mine spoils will move unchanged through the shallow ground-water system to the Tongue River; and
- that climatic conditions will remain constant.

In reviewing and analyzing the model output, remember that a model is a predictive tool. Accordingly, certain assumptions must be made, although those assumptions may not always be true in the natural system. The model refines our best estimate of future impacts to surface-water quality.

In the review process the following models were also considered:

- River Quality Model for the Northern Great Plains (Gherini and Summers, 1979) and

o Woessner Model on the Hydrologic Impacts from Potential Coal Strip Mining, Northern Cheyenne Reservation (Woessner and others, 1981).

The Northern Great Plains model is a data-intensive regional water-quality simulation model that can be used to predict the impacts of energy development activities, agricultural diversions, and waste-water discharges. Unfortunately, the model requires extensive amounts of data, collected over several years, thus requiring more time than was available during this petition process.

The Woessner water-quality model emphasizes salinity-related postmining impacts to surface and ground waters. This model was not used because of the lack of available data and because it is not as flexible as the USGS model. Basically, the USGS model takes into account and further develops the Woessner model, thus superseding it.

The draft document presented six simulations for each development scenario, considering high, average, and low flow for both the present and the enlarged Tongue River Reservoir (see table II-4 of the draft document). DSL and OSM chose additional scenarios of coal mine development. Table II-4 gives the data that were run for these scenarios in order to determine the cumulative impacts presented in this chapter. Please note that the worst-case scenario simulates the extremes of water-quality impacts.

b. Van Voast model

Wayne Van Voast of the Montana Bureau of Mines and Geology developed a mass-balance relationship to predict changes in specific conductance (SC) and, to a lesser extent, changes in sodium adsorption ratio (SAR), so as to predict theoretical changes in ground-water quality along the Tongue River. See the "Supplement to and Revision of Appendix D of the Draft Document" section of this chapter. The basic assumptions used in the model analysis are: (1) flow rates in ground water do not change, (2) conditions are uniform over the petition area, and (3) complete mixing of the ground water in the alluvium will occur. This specific model was developed for the petition area; alternative models were not available. Mass-balance modeling is an accepted technique.

2. Water Quality Criteria

DSL and OSM evaluated the TDS levels predicted by both the USGS and Van Voast water-quality models to see how such levels would affect domestic use, livestock use, and crop production. Criteria for setting TDS limits are somewhat arbitrary, as the hazard is highly dependent on the individual ions involved, kinds of use, methods of irrigation, and area of use.

For domestic water, a high concentration of TDS would probably make the water esthetically objectionable; accordingly, the 1962 Drinking Water Standards (U.S. Department of Health, Education, and Welfare, 1962) set a limit for TDS of 500 mg/L. Similarly, the Montana Department of Health and Environmental Sciences classifies TDS as a secondary parameter and recommends a maximum level of 500 mg/L (Steve Pilcher, oral communication, June 1981).

TDS criteria for livestock water should be such that animals of any species, age, or condition could use the water with negligible risk of economic loss. However, TDS limits should be no more severe than necessary to ensure the well-being of livestock. These criteria suggest that water containing 3,000 mg/L or less of soluble salts should be satisfactory for livestock under almost any circumstances. Although water with TDS levels near this limit might cause minor physiological upset, it would rarely cause economic losses or serious physiological disturbances (National Academy of Science, 1973). Because TDS levels often exceed 3,000 mg/L in arid or semiarid regions, table II-1 was developed for the use of saline waters.

Ground water in the petition area currently used by livestock averages 1,755 mg/L TDS and ranges from 510 mg/L to 3,460 mg/L (Lee, 1979; Slagel and Stimpson, 1979). However, six surface-water samples indicate that base-flow TDS levels in Otter Creek locally exceed 3,000 mg/L (Lee, Slagle, and others, 1981), and in Hanging Woman Creek they commonly range from 1,500 to 2,000 mg/L (Knapton and McKinley, 1977). Similarly, base-flow TDS levels in the Tongue River between the Tongue River Dam and Miles City range from 506 to 630 mg/L (Lee and others, 1981).

The suitability of water for irrigation depends on the amount and composition of the solids dissolved in it (U.S. Environmental Protection Agency, 1976). Table II-2 (U.S. Environmental Protection Agency, 1976; National Academy of Science, 1973) suggests criteria for classifying the TDS hazard of waters in arid and semiarid regions, and table II-3 presents similar criteria developed by McKee and Wolf (1974) on the basis of an extensive survey of the literature. Ultimately, the suitability of water for irrigation depends on the type of crop, the type of soil, and the acceptable yield reduction; and in fact, high-salinity-hazard waters from Otter and Hanging Woman Creeks and from many wells are currently being used for irrigation. Current practice is to flood areas irrigated by such waters to leach out salts that have accumulated.

3. New USGS Water-Quality-Modeling Scenarios

Page IV-17 of the draft document outlines the petitioners' allegations concerning the cumulative impact of several mines upstream from the petition area and potential industrial-municipal water withdrawals on the Tongue River. In summary, the petitioners felt that withdrawals would accelerate the decline of water quality in the Tongue River. Additionally, they felt that proposed and ongoing mining operations upstream from the petition area would compound the deleterious effects on the Tongue River from mining in the petition area.

In order to further evaluate this allegation, DSL and OSM used the USGS water-quality model to predict water quality for an assumed worst-case scenario. This scenario assumed: (1) intensive mining within the petition area, (2) additional intensive mining upstream of the petition area (along both Tongue River and Otter Creek), (3) the development of a coal-fired generator, (4) municipal withdrawal, (5) the development of a coal-gasification generator, and (6) increased irrigated acreage along the Tongue River (the irrigation acreage along Otter Creek was assumed to remain constant). The model was run using the most critical flow regimes of the Tongue River, namely, mean flow and reserved instream flow (minimum flow that would be released from the reservoir).

Table II-1.--Guide to the use of saline waters for livestock and poultry

(Source: National Academy of Science, 1973)

Total soluble salts content of water (mg/L)	Remarks
Less than 1,000	Relatively low level of salinity. Excellent for all classes of livestock and poultry.
1,000 to 2,999	Very satisfactory for all classes of livestock and poultry. May cause mild and temporary diarrhea in livestock not accustomed to the waters or cause watery droppings in poultry.
3,000 to 4,999	Satisfactory for livestock, but may cause temporary diarrhea or be refused at first by animals not accustomed to these waters. Poor for poultry, commonly causing watery feces, increased mortality, and decreased growth, especially in turkeys.
5,000 to 6,999	Can be used with relative safety for dairy and beef cattle, sheep, swine, and horses; avoid use for lactating or pregnant animals.
7,000 to 10,000	Unfit for poultry and probably for swine. Considerable risk in using for pregnant or lactating cows, horses, or sheep, or for the young of these species. In general, use should be avoided, although older ruminants, horses, poultry, and swine may subsist on these waters under certain conditions.
Over 10,000	Risks with these highly saline waters are so great that they cannot be recommended for use under any conditions.

Table II-2.--Dissolved-solids hazard for irrigation water

(Source: U.S. Environmental Protection Agency, 1976; National Academy of Science, 1973)

Total dissolved-solids content of water (mg/L)	Remarks
500	Water from which no detrimental effects will usually be noticed.
500 to 1,000	Water which can have detrimental effects on sensitive crops.
1,000 to 2,000	Water that may have adverse effects on many crops and requires careful management practices.
2,000 to 5,000	Water that can be used for tolerant plants on permeable soils with careful management practices.

Table II-3.--Summary classification of irrigation waters, associated water quality criteria, and recommended maximum concentrations of trace elements for all plants in continuously used irrigation waters

(Source: Mckee and Wolf, 1974)

	Water class[1]		
	I	II	III
Boron (mg/L)	less than 1.0	less than 2.0	less than 3.0
SAR	[2]less than 1.0 to 4.2	1.0 to 11.6	greater than 9.0 to 11.6
Chlorine (meq/L)[3]	less than 2.0 to 5.5	2.0 to 16.0	greater than 6.0 to 16.0
Sulfate (meq/L)	less than 4.0 to 10.0	4.0 to 20.0	greater than 12.0 to 30.0
Specific conductance	[4]less than 500 to 1,000	500 to 3,000	greater than 2,500 to 3,000
TDS (mg/L)	less than 700	350 to 2,100	greater than 2,500 to 3,000
Salinity hazard	low to medium	medium to very high	very high

[1]The water classes are defined for two purposes: First, in relation to overall soil/climate management, as:

I (excellent to good; suitable under most conditions),
II (good to injurious; harmful under certain conditions of soil, climate, and practices), and
III (injurious to unsatisfactory; unsuitable under most conditions),

and, second, in relation to plants, as:

I (suitable for irrigation of all or most plants, including salinity- and boron-sensitive species),
II (not suitable for most salinity- and boron-sensitive plants; suitable for all tolerant and many semitolerant species), and
III (unsatisfactory for most plants except those that have a high tolerance for saline conditions and high boron levels).

[2]Recent work favors the upper limit.

[3]meq = milliequivalents.

[4]In umhos/cm at 25°C.

The mined acreage within the petition area was estimated using recoverable coal resource information from the USGS office in Casper (written communication, 1981). The mined acreage outside the petition area was estimated using potential lease tracts. The quantities of water released from the Tongue River Dam were assumed to be those developed for use with the USGS water-quality model. TDS levels in water released from the Tongue River Dam were modified to account for increased loading from the Big Horn, Welch I, Whitney Benefits, Ash Creek, Pearl, CX, Decker, East Decker, North Decker, and Spring Creek mine areas (Wayne Van Voast, written communication, 1981). These TDS levels were calculated based on the following equation:

$$\text{postmining TDS} = \text{premining TDS} + \frac{7{,}080 \times (\text{ft}^3/\text{sec/mg/L})}{\underline{X}\ \text{cfs}}$$

For this equation, the premining TDS levels are those developed for use with the USGS water-quality model (Woods, 1981).

Industrial and municipal withdrawals were derived from the Yellowstone Impact Study Technical Report 1 (Department of Natural Resources and Conservation, 1977), using a combination of intermediate and high-development scenarios for the Tongue River basin. The industrial withdrawal assumed coal generation on Reach I (fig. II-2) and coal gasification on Otter Creek. It should be noted that industrial development in Otter Creek withdraws water from Reach II of the Tongue River. Municipal withdrawals of water from the Tongue River were assumed to occur at Ashland (Reach III).

Worst-case analysis further assumed that, as a result of the increased capacity of the Tongue River Reservoir, an additional 13,750 acres along the Tongue River would be irrigated (Rick Bondy, oral communication, 1981). Irrigated acreage for Pumpkin, Hanging Woman, or Otter Creeks were assumed to remain at current levels. The assumed leachate for the runs was derived from the method described by Van Voast in the "Supplement to and Revision of Appendix D of the Draft Document" section of this chapter. For a complete summary of inputs, see table II-4.

4. Water-Quality-Modeling Results

The impact of projected TDS levels was determined by comparing those levels to published standards for irrigation and livestock use, and by evaluating their effect on irrigated soils. Several points must be stressed in order to better understand the results of the analyses:

1. The analyses are, of necessity, broad-based. Because of the time limitations imposed by the petition process, the analyses do not consider local variations in the soil type, which may be important in relation to potential irrigation hazards.

2. The local impact of increased TDS levels can be lessened by water management techniques such as flooding to leach accumulated salts. Some of those techniques may be limited by the lack of water of sufficient quality or by economic considerations.

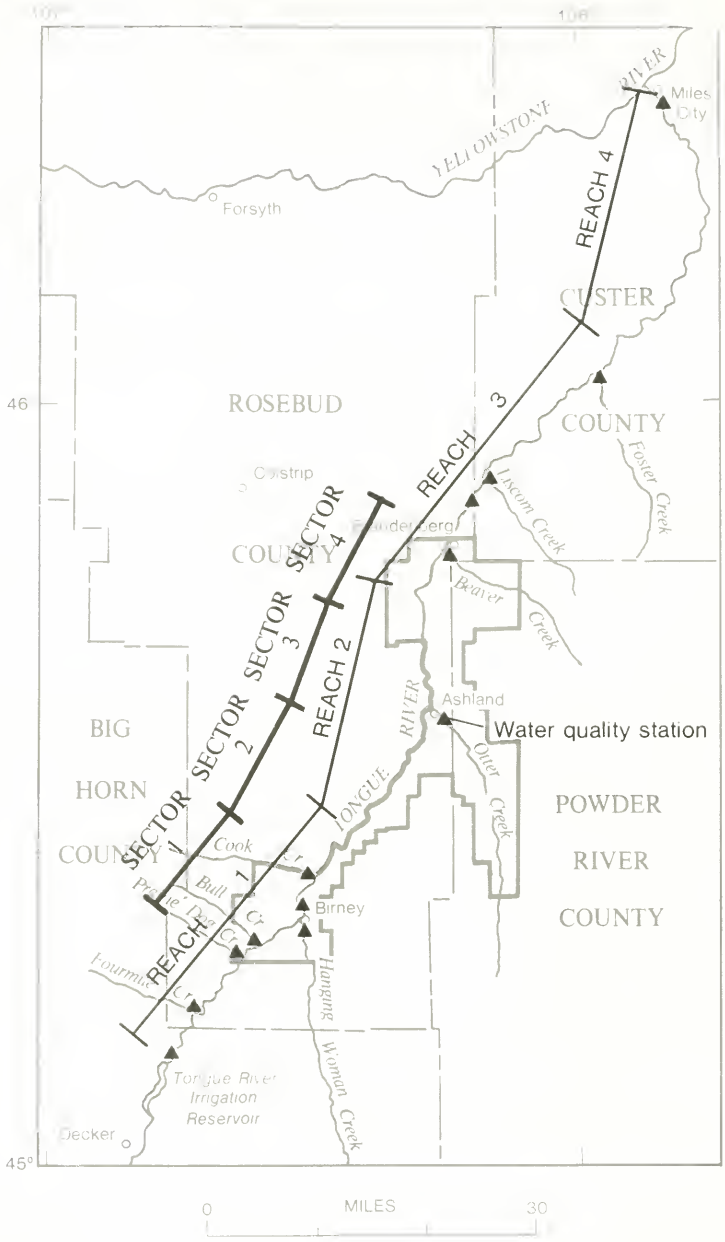

Figure II-2.--Location of selected water-quality stations, seepage run reaches, and Van Voast sectors.

Table II-4.--Input data used in USGS water-quality model

(Using the USGS model, water quality of the Tongue River Basin was evaluated at both mean and instream (worst-case) flows as follows: The various reaches named in the first half of the table identify segments of the Tongue River, as it flows from the Tongue River Dam north to Miles City (the river's mouth), and of its tributaries. For each of these reaches, data for potential acres of mining, quality of mined leachate,[1] and potential industrial and municipal withdrawals, together with monthly data from the second half of the table, were input to determine postmining water quality)

	Mined area (acres)	Mined leachate (mg/L)	Municipal and industrial withdrawals (acre-ft/yr)
Reach I	10,000	4,180	30,000
Reach II	8,842	2,423	9,000
Reach III	13,562	1,795	360
Reach IV	0	0	0
Reach V	0	0	0
Otter Creek	53,047	3,850	0
Hanging Woman Creek	21,600	4,000	0

Monthly flow inputs from the Tongue River Reservoir

Month	Mean flow		Instream flow	
	Discharge (acre-ft)	TDS concentration (mg/L)	Discharge (acre-ft)	TDS concentration (mg/L)
January	22,140	425	9,220	597
February	21,689	426	8,330	617
March	31,550	372	9,220	597
April	50,779	311	8,920	604
May	129,950	221	23,700	415
June	185,423	195	41,640	335
July	72,099	274	12,790	524
August	46,248	322	9,220	597
September	37,167	349	8,920	604
October	34,297	361	11,680	544
November	30,996	374	11,300	550
December	24,846	407	9,220	597

[1]Mined leachate values are additions to existing TDS levels.

3. The projected TDS levels are the result of a mass-balance approach; as such, the results are highly sensitive to the inputs used.

a. USGS water-quality-model discussion—surface water

The following discussion is based on analyses made subsequent to those presented in the draft document. The results noted in the draft document are, therefore, replaced with the following.

To further evaluate the allegation that surface coal mining operations in the petition area would result in substantial loss or reduction of long-range productivity of the water supply, DSL/OSM defined an assumed worst-case scenario that included:

- o Intensive mining upstream from the Tongue River Reservoir;
- o Intensive mining between the petition area and the Tongue River Reservoir;
- o Intensive mining within the petition area;
- o The development of a coal-fired generator;
- o Municipal withdrawal;
- o A coal-gassification plant; and
- o Increased irrigation along the Tongue River (irrigation remains constant along both Otter and Hanging Woman Creeks).

Additionally, four other scenario simulations were made to evaluate various levels of mining and industrial development along the Tongue River:

- o Scenario 1 (no mining) modeled the present water quality at average monthly flow levels. This scenario compared computer results with computer results, rather than comparing actual conditions to computer results. Thus, all data were subjected to the same manipulations.
- o Scenario 2 modeled mining of the petition area (51,562 acres mined) along with increased irrigation, a coal-gassification plant, increased municipal withdrawal, and mining upstream from the reservoir.
- o Scenario 3 modeled mining of the petition area (51,562 acres mined) along with mining upstream from the reservoir, but without industrial-municipal withdrawals.
- o Scenario 4 modeled mining of various acreages within the petition area along with mining upstream from the reservoir.

To focus on the most critical flow regimes, instream flow conditions (the minimum release from the reservoir) of the Tongue River were used in the model.

Currently, the crops grown in the petition area are either salt-tolerant (barley, sugar beets) or semitolerant of salts (alfalfa). The soils in both the Tongue River and Otter Creek are listed by the Soil Conservation Service as moderately permeable and as suitable for irrigation if moderate to special management practices are used. Crops are irrigated throughout the growing season on the Tongue River, whereas on Otter Creek crops are irrigated primarily during spring runoff.

Tongue River area

Analysis of water quality of the Tongue River was evaluated for two time periods--one annual and one for the irrigation season. Within each time period, the agencies compared the present water quality with that simulated in the various scenarios and with published water-quality criteria.

Annual analysis.--The worst-case simulation was not completed for the entire year, as the input values (i.e., water) for industrial-municipal withdrawals could not be supplied on an annual basis (no streamflow beyond reach III after August). Thus, the assumed worst-case scenario is excessive, as the water demand could not be satisfied during low-flow condition. In all likelihood, the siting of both the assumed coal-fired generator and the coal-gassification plant along the Tongue River drainage would be precluded if the requirement for water could only be supplied by the Tongue River.

Present TDS levels of the Tongue River are shown in table II-5. Tongue River water is currently classified as having low to medium salinity hazard for irrigation (tables II-2, II-3) and as excellent for livestock use (table II-1).

Scenario 1 showed the same water quality as at present.

Scenario 2 showed water quality of a medium salinity hazard to a high salinity hazard at Brandenberg Bridge (table II-5). When the analysis was shifted to Miles City, the water quality ranged from a medium salinity hazard to water that would be unusable for irrigation (table II-5).

Scenario 3, or the worst-case scenario without industrial or municipal withdrawals, indicated that water quality would range from a low to medium salinity hazard at Brandenberg Bridge and a medium to high salinity hazard at Miles City.

Scenario 4 is a summary of four different limited-mining scenarios. The results were similar under each different run. The results indicated water quality which ranged from a low salinity hazard to a medium salinity hazard (table II-5).

Irrigation-season analysis.--The irrigation season along the Tongue River is assumed to extend from May through November for this analysis. Currently, the water, during June through September, is highly suitable for irrigation use. During May, October, and November, the water would have a detrimental effect upon salt-sensitive crops (table II-2) and represents a low to medium salinity hazard (table II-3).

Scenario 2 indicated that during June, at Brandenberg Bridge, the water would be highly suitable for irrigation use. But during May, July, August, September, October, and November, the water would have detrimental effects on

Table II-5.--Impacts to Tongue River water quality under different scenarios

Scenario	TDS (mg/L) Mean	TDS (mg/L) Range	Comments[1]
Annual levels			
Present condition:			
Brandenberg Bridge	512	203 - 868	1, A/B
Miles City	548	234 - 912	1, A/B
Scenario 1:			
Brandenberg Bridge	801	450 - 1,074	1, A/B
Miles City	988	534 - 1,968	1, A/B
Scenario 2:			
Brandenberg Bridge	896	463 - 1,391	2, A/C
Miles City	1,946	556 - 11,888	2, B/E
Scenario 3:			
Brandenberg Bridge	897	519 - 1,430	
Miles City	1,102	603 - 2,465	
Scenario 4:			
Brandenberg Bridge	802 - 812	453 - 1,096	
Miles City	991 - 1,000	535 - 2,000	
Irrigation season only (May through November)			
Present condition at Brandenberg Bridge	437	203 - 868	June through September: 0; May, October, November: 1, B
Scenario 2 at Brandenberg Bridge	891	463 - 1,391	May, June: 0; July through November: 1, C

[1] Comments are coded as follows: 0 = highly suitable for irrigation; 1 = low to medium salinity hazard; 2 = medium to high salinity hazard; 3 = high to very high salinity hazard; 4 = very high salinity hazard; 5 = exceeds levels reviewed in table II - 3; A = no detrimental effects noticed; B = detrimental effects on sensitive crops; C = adverse effects on many crops, requires careful management; D = usable for tolerant plants on permeable soils with careful management; E = exceeds levels reviewed in table II-2. Refer to tables II-2 for II-3.

sensitive crops (table II-2) and would have a medium to very high salinity hazard rating (table II-3). During August the water would be unusable for irrigation, due primarily to the high water demand by industrial and municipal users.

Summary of inpacts to the Tongue River.--DSL/OSM analysis of the worst-case simulation indicated that the river would go dry during August due to excessive industrial withdrawals. If the analysis is limited to the mining-related impacts (as in scenario 3) under the intensive mining scenario, there is a significant rise in TDS levels at Miles City and to a lesser extent at Brandenberg Bridge; however, the water would remain usable throughout the critical irrigation season. Under scenario 4 (mining in one reach only, or a combination of lower mining acreage in various reaches), there is an insignificant rise over projected TDS levels of a scenario of irrigation in combination with no mining in the petition area.

When scenario 2 is considered (intensive mining and industrial development), the water quality would be degraded to the point that it would be unusable for irrigation during August under current irrigation practices. However, when the analysis is limited to mining impacts only there is an increase in TDS levels, but the water would remain usable for irrigation. While there may be crop reductions or soil damage due to the increased TDS levels from the increased irrigation plus mining, it is not possible to project the probability that (or to what degree) it would occur. When the analysis is limited to more discrete mining areas, the increase in TDS levels would be insignificant compared to projected TDS levels with increased irrigation in combination with no mining in the petition area.

Under the worst-case simulations the water would be unusable for livestock in August; however, under all the "mining only" simulations the water would remain usable and within the range currently utilized for livestock in southeastern Montana.

Otter Creek area

The refined analysis of Otter Creek compared four scenarios to the present water quality of Otter Creek. Present quality was defined by the data in the reports of Knapton and McKinley (1977), Lee, Slagle, and Stimpson (1981), Knapton and Ferreira (1980) and the Montana Water Supply Papoers (1975, 1976, 1977, 1978, 1979, 1980). The four scenarios modeled were:

- o No mining (simulated present conditions), assuming the 50th percentile flow (the average flow) of Otter Creek;
- o Worst-case mining--that is, mining a total of 53,047 acres on Otter Creek, both in the petition area and in the Moorhead coal field upstream from the petition area, assuming a weighted mean average leachate of 3,850 mg/L;
- o Mining of only the petition area; and
- o Mining of only the Moorhead coal field.

All four scenarios assumed irrigated acreage would remain at 785 acres. The TDS levels for each scenario are given in table II-6. As with the Tongue River, the analysis was done on both an annual and an irrigation-season basis.

Table II-6.--Impacts to Otter Creek water quality under different scenarios

Scenario	TDS (mg/L) Mean	TDS (mg/L) Range	Comments[1]
Annual levels			
Present condition	2,084	228 - 2,750	1 through 4, A through D
No-mining scenario	2,176	1,752 - 2,560	3, C/D
Worst-case scenario	3,376	2,067 - 5,185	4/5, D/E
Mining petition area only scenario	2,690	1,887 - 3,494	3, C/D
Mining Moorhead only scenario	2,807	1,918 - 3,782	3, C/D
Irrigation season only (March through June)			
Present condition	1,716	228 - 1,640	March: 2, C; April through June: 4, D
No-mining scenario	2,068	1,752 - 2,193	March: 4, C
Worst-case scenario	2,575	2,067 - 2,982	April through June: 4, D
Mining petition area only scenario	2,285	1,887 - 2,531	March: 3, C April through June: 4, D
Mining Moorhead only scenario	2,807	1,918 - 3,782	March: 3, C April through June: 4, D

[1]Comments are coded as follows: 0 = highly suitable for irrigation; 1 = low to medium salinity hazard; 2 = medium to high salinity hazard; 3 = high to very high salinity hazard; 4 = very high salinity hazard; 5 = exceeds levels reviewed in table II - 3; A = no detrimental effects noticed; B = detrimental effects on sensitive crops; C = adverse effects on many crops, requires careful management; D = usable for tolerant plants on permeable soils with careful management; E = exceeds levels reviewed in table II-2. Refer to tables II-2 for II-3.

Annual analysis.--At present, the salinity hazard of water in Otter Creek (table II-3) ranges from low (at high flows) to high (at low flows). At the lower flows the water is classified as suitable for use on salt-tolerant plants on permeable soils with careful management practices (table II-2). Note also that the soils along Otter Creek have been rated by the Soil Conservation Service as moderately permeable and as suitable for irrigation if moderate to special management practices are used. Under current management practices, the soils there are flooded with spring-runoff waters to leach out accumulated salts.

The no-mining scenario modeled the present water quality at the average monthly flow levels. The model indicated that at this flow level Otter Creek water may actually have a high to very high salinity hazard. This evaluation compared computer results with computer results, rather than comparing actual conditions to computer results. Thus, all data were subjected to the same manipulations. So, the present Otter Creek water, according to computer evaluation, ranges in quality from "may have an adverse effect on many crops" to "usable for salt-tolerant plants on permeable soils with careful management practices" (table II-2).

Under the worst-case scenario, mean annual TDS levels would increase 38 percent above present levels and 36 percent above the no-mining scenario (table II-6). TDS levels at the upper end of the predicted annual range would be higher than any levels classified by McKee and Wolf or by EPA. Even these high TDS levels would have relatively little effect on irrigation, however, because during the irrigation season (see next section) the TDS levels would decrease as flow increased. Therefore, water use would be limited more by the quantity of water rather than by its quality.

For mining only within the petition area, mean annual TDS levels would rise 14 percent above present levels and 11 precent above the no-mining scenario. Neither the EPA nor the McKee and Wolf classifications would be exceeded. Rather, the water would have a high to very high salinity hazard, and at higher TDS levels would be suitable for use on tolerant plants on permeable soils with careful management.

For mining only in the Moorhead tract, mean annual TDS levels would increase 26 percent over present levels and 22 percent above the no-mining scenario (tables II-6, II-2, and II-3). Accordingly, they would increase more than for mining in the petition area alone, but less than for worst-case mining. Hazard and use restrictions would be the same as for mining only in the petition area.

Irrigation season analysis.--The highest use of Otter Creek waters for irrigation occurs from March through June. After June quantity rather than quality ususally precludes further use. The present water quality during this 4-month period is shown in table II-6. In March water is considered to have a medium to very high salinity hazard and may have a detrimental effect on many crops. In April, May, and June the water is classified as having a very high salinity hazard and can be used on tolerant crops with care. See also tables II-2 and II-3.

Under the no-mining simulation, TDS levels are projected to be somewhat higher (table II-6), although hazard and use restrictions do not change.

For the worst-case scenario, mean TDS levels during the irrigation season would rise 33 percent above present levels and 20 percent above the no-mining scenario. Both the mean and the range of TDS values would be smaller for the

irrigation season than for the year as a whole (table II-6). Hazard and use restrictions would change from the present restrictions only in March, when the salinity hazard would become very high and the water should be used on tolerant plants on permeable soils with care (tables II-2 and II-3).

For mining only in the petition area, mean TDS levels during the irrigation season would rise 25 percent above present levels and 15 percent above the no-mining scenario.

For mining only in the Moorhead coal field, mean TDS levels during the irrigation season would rise 26 percent above the present levels and 12 percent above the no-mining scenario.

For both the preceding scenarios, the salinity hazard would be high in March, and might have an adverse effect on crops. During April, May, and June, however, the water quality would have the same hazard and use restrictions as at present. See tables II-2 and II-3.

Summary of impacts to Otter Creek.--Under all scenarios water would remain excellent for livestock use and suitable for irrigation; it would continue to have the same hazard and use restrictions during the irrigation season as at present, even under the worst-case scenario. Although TDS levels would increase under all mining scenarios, they would vary with flow; thus, it was not possible to predict whether crop production would decrease or soil salts would increase over time. Irrigation would more likely be precluded by the quantity of available water than by its quality.

b. Salinity-flow-modeling discussion--shallow ground-water aquifers

The Van Voast assessment was refined on the basis of further analyses of data from the DSL/OSM drilling program. (See the "Supplement to and Revision of Appendix D of the Draft Document" section of this chapter). Van Voast predicted the water-quality changes both in the spoils replacing the shallow Tongue River Member aquifers and in the Tongue River alluvium (appendix D, draft document). His projections, based on saturated-paste extracts from the upper 50 feet of overburden (appendix E, draft document), show that the SC of the postmining spoil water would increase over the premining SC (estimated to average 3,300 micromhos/centimeter (umhos/cm)) by the amount contributed by the spoils. Accordingly, the postmining TDS values in the aquifer would range from 3,580 to 6,800 mg/L compared with the estimated premining level of 2,310 mg/L (conversion factor = 0.7; see appendix C, draft document). The spoils water would not move down gradient into undisturbed Tongue River Member aquifers, because the assumed mining would take place along discharging outcrops and subcrops of the coal bed and of the interburden aquifers.

As part of DSL/OSM's analysis of the allegation that withdrawals would accelerate the decline of water quality in the Tongue River, Van Voast used mathematical salinity and flow modeling techniques to predict the effect of surface mining on water quality in the Tongue River alluvium (appendices A and D, draft document). His prediction is that, after mining all strippable coal in the petition area, SC values in waters in the alluvium of the four subreaches of the valley would increase as much as 2,440, 960, 370, and 520 umhos/cm (downstream order, respectively) above the present estimated mean value of 1,490 umhos/cm.

Accordingly, TDS values would increase by 1,710, 670, 260, and 360 mg/L in these reaches (conversion factor = 0.7; see appendix D, draft document), so total TDS levels would be 2,750, 1,710, 1,300, and 1,400 mg/L. The existing mean TDS level (1,040 mg/L) is in the high salinity hazard range for irrigation (table II-2, draft document); the predicted postmining levels are in the high to very high hazard ranges. However, the water would still be usable for livestock.

The greatest increases in TDS would occur on the mined lands, where water in shallow aquifers that was considered good for livestock use before mining would remain usable for livestock after mining. In these areas, the water that would be needed to support postmining land use can be obtained from deeper sources. (See discussion of water supplies in chapter II of the draft document.) Completing wells into deeper aquifers would be more expensive owing to the increased drilling and pumping depth and to the difficulty of drilling through spoil.

E. CORRECTIONS TO CHAPTER IV, VEGETATION AND SOILS, OF THE DRAFT DOCUMENT

Please make the following corrections in your copy of the draft document:

Throughout this section of the draft document (1) capitalize "Yamac" when it occurs in "yamac loam, alkali" soils, (2) change the date for the reference "Dollhopf and others" from 1981 to 1980, and (3) note that the unit of measurement for electrical conductivity (EC) with regard to soils is millimhos/centimeter (mmhos/cm).

The reference "Shafer, 1979" should be added to those references cited at the bottom of page IV-24 of the draft document and should replace the "U.S. Department of Agriculture, 1978" reference in the fourth paragraph of page IV-32.

Completion of the analysis of the Soil Conservation Service data resulted in the following conclusions, which replace those conclusions presented on pages IV-24 and IV-32 of the draft document: (1) the areal extent of saline or sodic soils, or both, is 1,040 acres, or 2.1 percent of the acreage of strippable coal reserves and (2) about 64 percent of this acreage is dominated by shallow soils.

Three sentences have been revised as follows:

1. The last sentence of the last full paragraph on page IV-28 of the draft document should read: "This latter area was mapped by the Soil Conservation Service (SCS) as 'Yamac loam, alkali' which, as previously noted, is one of the SCS's mapping units which have little importance in the petition area."

2. The second and third sentences of the first full paragraph on page IV-36 of the draft document should read: "The second statement appears to be self-contradictory, because if sufficient suitable materials are available for burying sodic spoils, it does not follow that a need exists for hauling water, adding soil amendments, and providing drainage."

F. REVISIONS TO CHAPTER IV, SOILS, OF THE DRAFT DOCUMENT

Completion of the DSL/OSM analysis resulted in extensive additions to, and minor replacements for, paragraphs on pages IV-26, IV-27, and IV-33 of the draft document. Those pages are reproduced here, for clarity's sake, with the changes in question underlined.

Thus, pages IV-26 and IV-27 now read as follows:

> "* * *greater volume of soil would be available in the Montco area if certain soils with abundant coarse fragments were salvaged for special reclamation purposes, such as for the reestablishment of ponderosa pine and skunkbush sumac.
>
> "U.S. Bureau of Land Management and U.S. Bureau of Reclamation soils data for about 8 sections of land in the Otter Creek drainage (see EMRIA studies referenced above) reveal some soils as being highly saline (EC's greater than 15 millimhos per centimeter (mmhos/cm)) and/or moderately sodic (SAR's up to 20). However, interpretations of these data suggest a wide range in the thicknesses of suitable surface material (0 to 60 inches). Because of the limited analytical data base, it is difficult to derive weighted averages of suitable surface soil material from these studies, except possibly for EMRIA report No. 1, where an average suitable depth of 18 inches can be calculated for 1,224 acres covering three different sections of land. But even here, the calaculations are based on limited or no data on some soils. Furthermore, classification of the soils of the other EMRIA sites by the U.S. Bureau of Land Management/U.S. Bureau of Reclamation for reclamation purposes indicated that 24 to 54 percent of lands involved were Class I or II, which are defined in these studies of those lands having the soils best suited for reclamation. Therefore, because of the limited analytical data base, the variability of the quantity of suitable material that has been suggested to exist, and the limited extent of land studied in relation to reclamation in the Otter Creek area, more comprehensive sampling and analysis would be necessary as a part of any future site-specific mining and reclamation paln development to identify the location and to define the volume of suitable surface soil materials for reclamation purposes. This would be required pursuant to the State surface mining rules (Montana ARM 25.4.304(13)).
>
> "DSL and OSM collected soil samples from 18 sites in the petition area, representing a range of materials from shallow, residual soils on steep uplands to deep, alluvial soils on flood plains. Laboratory analysis of these samples (available in the public record) revealed excessive levels of salt and/or sodium at four of the sites. All four sites represented deep alluvial materials, and the data indicated that 1 to 3 feet of suitable soil material was available at these sites despite the elevated salts which occurred in the subsoils. Two of these four sites were dominated by greasewood and were located in the SCS mapping unit "Yamac loam, alkali." Because of the results of DSL's/OSM's sampling at these two sites, it can reasonably be concluded that suitable soil volumes within this mapping unit are highly variable. Only further intensive sampling of this type of mapping unit would indicate the average availability of suitable soil material. 'Yamac loam, alkali' is

one of many of the saline/sodic mapping units of the SCS soil survey, all of which have a very limited occurrence in the general area of strippable coal reserves in the petition area, as discussed on page IV-24.

"Soils data for the other 14 sites sampled by DSL and OSM indicated no apparent limitations and would represent suitable materials for revegetation.

"During the summer of 1981, Peabody Coal Company conducted a survey and surface soil sampling program on a large area north of Ashland in and near the petition area. The survey covered the following townships: T. 1 S., R. 44 E.; T. 1 S., R. 45 E.; T. 1. S., R. 46 E. (east of the petition area); and N½ of T. 2. S., R. 44 E. outside the Northern Cheyenne Indian Reservation. The survey consisted of a review and sampling of SCS soil mapping units in the above area and was submitted as part of Peabody's intervention (dated September 16, 1981) on the petition.

"Sixteen soil profiles were described and sampled for analytical purposes as part of this survey. Only two of the profiles exhibited elevated SAR and/or soluble salt (EC) levels--that is, greater than 12 and 6 mmhos/cm, respectively. Textures ranged from sandy loam to clay loam, and saturation percentages did not exceed 55 percent. Thus, in all of these respects, the soils sampled exhibited satisfactory characteristics for reclamation.

"Peabody's report concluded that the lower salvage potential of some soil mapping units, because of steep slopes, the distribution of rock outcrops, shallow soils, and significantly dissected topography in the area surveyed, present greater problems than do the sodium or salt levels in the surface soils. We agree that these factors could affect the salvageability of soils, which, in turn, could affect the volume of suitable surface soil available for reclamation purposes. However, only by evaluating more detailed information in a site-specific mining and reclamation plan for that area could it be determined whether enough suitable surface soil would be available for successful reclamation. To date, no mining and reclamation plan has been filed for the area of concern in Peabody's survey. In addition, Montana regulations allow the mine operators to compensate for a lack of suitable surface soil by using suitable overburden. (This is discussed on page IV-33 of the draft and in the response to comment 20, chapter III of this document.)

Peabody's report also contained some laboratory analysis of clay mineralogy of the surface soils sampled. This analysis appears to contain the same complicating factor as discussed on pages IV-30 to IV-31. As a result, an interpretation of these data will not be made here.

"Overburden.—Montco has presented overburden data for 62 drill holes in its project area (Montco, 1980d, v. N, tables N-13 through N-91). Highly sodic (SAR's of 40 and above) and fine-textured materials (clay contents exceeding 50 percent) were identified in various locations and strata. However, examination of the data revealed that an average depth of about 20 feet to over 50 feet of suitable and reasonably

accessible overburden or interburden would be available in the various areas for which Montco has indicated long-range mining interests. Use of this suitable overburden and interburden would be required of Montco in order to meet the basic 8-foot burial requirement of material not conducive to revegetation, such as sodic, saline, and very fine textured materials (Montana ARM 26.4.506).

"The location of suitable geologic materials on the Montco project area varies from overburden to interburden and varies among drill holes. The data indicate no suitable material for some drill holes. Thus, the ultimate decision on reclaimability according to State and Federal regulations would necessitate evaluation of a site-specific mining and reclamation plan. Such a plan must describe in detail the company's plan to separately handle suitable and unsuitable overburden materials in order to isolate the unsuitable materials below the rooting zone.

"More limited overburden data are available from those portions of the petition area not within the proposed Montco mine area. These include information on (1) 5 holes on the 1977 and 1978 EMRIA study sites on Otter Creek, (2) 2 additional holes drilled by Montco northeast of Ashland (Montco, 1980d, v. 23, table M-1; and unpublished data of Montco), and (3) 35 holes drilled in April 1981 throughout the petition area (excluding the Montco project area) as part of the DSL-OSM overburden sampling project. As with the Montco project area, there is a high degree of variability in the suitability of materials that exist in these other portions of the petition area.

"Data from the overburden of five drill holes in the area north of Ashland and West of the Tongue River indicate that an average of about 20 feet of suitable and reasonably accessible material are available. In the area north of Ashland and east of the Tongue River, data from 16 drill holes indicate that suitable overburden materials averaging 65 feet thick are present.

"In the Otter Creek drainage, data from the material associated with the 14 drill holes suggest the occurrence of approximately 40 feet of suitable materials. Also, Consolidation Coal Company submitted data on one of its drill holes in sec. 21, T. 4 S., R. 45 E. These data indicated suitable overburden from 42 to 172 feet. (However, no information was submitted on the surface (uppermost) 42 feet.) The distribution of suitable and unsuitable material in Otter Creek appears to be somewhat clustered or nonrandom. For example, in T. 5 S., R. 45 E., four of the five holes drilled in this portion of the petition area had no suitable overburden. However, these five holes occurred on only three different sections of land, compared to the 19½ sections of land in this township within the petition area.

"Thus, the delineation of more definitive patterns in this distribution, if they indeed exist, would require considerably more overburden sampling and characterization than is available to date.

"Other available overburden information consists of data for six drill holes east of the Montco project area on the south side of the Tongue River. These data indicate that an average of 15 to 30 feet of

unsuitable surface materials overlie about 20 feet of suitable overburden material in the area. The accessibility of such material for special handling would be of primary concern from a reclamation standpoint. By Montana laws and rules, a mining and reclamation plan would have to describe in detail the methods to be used to systematically identify and separately handle these materials. (See 82-4-231 MCA and Montana ARM 26.4.506.) Whether such special handling in this particular area would be economically feasible canot be determined.

"No direct overburden information is available for that portion of the petition area west of the Tongue River and south of the Northern Cheyenne Indian Reservation. However, there appears to be no reason to suspect that the characteristics of the materials here differ from those described earlier for all other portions of the petition area. Even so, the possibility that this may be the case cannot be wholly discounted. Thorough characterization by mining companies of overburden materials in this area would be required as part of any site-specific mining and reclamation plans pursuant to 82-4-222(1)(j) MCA, and Montana ARM 26.4.304(7).

"In summary, all information available at this time indicates that, although highly saline and sodic soil and overburden materials occur in the petition area, significant volumes of suitable soil and overburden materials also occur. This contradicts the allegation that there are inadequate materials for revegetation. Whether, in specific areas, sufficient suitable soil and overburden are available in locations amenable for special handling for reclamation purposes can only be ascertained by intensive characterization of soils and overburden in such areas and by the evaluation of site-specific mining and reclamation plans in these areas."

Page IV-33 of the draft document now reads as follows:

"* * *in complexes or associations which also contain areas of unsuitable or no soil material. Such salvage efforts (to the practical limits of human and mechanical capability) are required by Montana ARM 26.4.701, which states that all available topsoil, including A, B, and C horizons, will be salvaged from the area of land to be disturbed.

"If we thus consider only those mapping units dominated by soils with 6 inches or less of available soil material as being too shallow for recovery, we find that these mapping units make up 17 percent of the area under consideration. This finding does not support the allegation that well over 50 percent of the soils are too shallow for recovery.

"Consideration was also given to potential limitations in the salvage of soils within mapping units not dominated by soils with less than 6 inches of unsuitable material but which were described by the SCS as having slopes of 15 to 45 percent through 35 to 70 percent, or having highly dissected topography. This category of soil mapping units comprises an additional 15 percent of that portion of the petition area underlain by strippable coal reserves and is mutually exclusive of the '17 percent-shallow soil' category described earlier.

"Various slope angles within the two ranges identified above, especially at higher values, could preclude effective salvage of the soil thereon. This problem could be enhanced if rock outcrops or other obstructions were located in a fashion which presented further obstacles to salvage efforts. Also, many soils occurring at the upper end of these slope ranges would probably contain less than 6 inches of suitable material. However, other soils in this category of mapping units--especially at the lower end of the slope values--would have sufficient depths for recovery and a lower potential for topographic limitations to salvage efforts.

"Thus, three categories of shallow soils have been considered in relation to their potential recovery for reclamation purposes: (a) those with predominantly less than 20 inches of suitable material (64 percent of the strippable coal resource area); (b) those with predominantly less than 6 inches of suitable material (17 percent of the same area); and (c) those with possible topographic limitations to recovery of soils (15 percent of the same area). Categories (b) and (c) are part of category (a). In all these categories, some soils could be salvaged, and some could not. This information is not particularly conclusive as to the reclamation potential of the area of concern. Only with more detailed site-specific information and evaluation of the soils resource in relation to specific mining and reclamation plans can a determination of reclamation potential best be realized.

"A final point with regard to the shallow soils issue involves the possibility of a mining company proposing to use suitable overburden materials in place of or along with surface soil (Montana ARM 26.4.703). Such a proposal would require documentation by the company of problems with quality or quantity of existing surface soil. It would also require that the company adequately demonstrate (through analytical testing, greenhouse tests, field trials, etc.) that use of such material would be consistent with the basic reclamation and environmental protection performance standards of the Montana act and rules.

"Keeping in mind the above considerations and current data, as well as the earlier discussion concerning the fact that significant volumes of suitable overburden could be identified in the petition area, the allegation that it is unlikely that sufficient quantities of salt-free soil or overburden materials needed for revegetation could be found in the petition area cannot be substantiated. This does not mean that sufficient quantities of suitable soil and overburden are therefore available for reclamation, nor does it mean that successful reclamation of the petition area is therefore ensured, should mining occur. These issues will only be determined by extensive site-specific data and information which is required to be included in specific mining and reclamation plans submitted for a mining permit.

Effects of sodium and salts on vegetation

"Page 8, paragraph 14, alleges:

'Soluble salts inhibit plant growth and can prevent successful reclamation from being achieved. Opper affidavits, Exh. 9, paragraph 5.'

"Page 8, paragraph 15, alleges:

'High exchangeable sodium concentrations in the soil and overburden would have adverse effects on both plant growth and soil structure. Poor soil structure results in low infiltration, low root penetration, poor gas exchange, and accelerated erosion. Opper affidavits, Exh. 9, paragraphs 5, 6, 8.'

"The concepts expressed in the above two paragraphs are generally accepted and are well documented in Mr. Opper's affidavit. The relationship of saline/sodic soil and overburden materials to the petition area has been addressed in detail in* * *."

G. SUPPLEMENT TO, AND REVISION OF, APPENDIX D OF THE DRAFT DOCUMENT

The following material is a revision of earlier work (entitled "Theoretical Effects of Hypothetical Mine Spoils on Quality of Ground Water in Alluvium along the Tongue River" and reprinted as appendix D of the draft document) by the Wayne Van Voast, of the Montana Bureau of Mines and Geology, modeling postmining water quality in the petition area. This revision, which replaces appendix D of the draft document, is based on further analysis of available data and coal resource information provided in the draft document by the USGS Casper office:

"Theoretical changes in water quality were estimated using the following mass-balance relationship:

Inflow from upstream alluvium (rate times quality)	+	Recharge from the surface (rate times quality)	+	Inflow from coal, overburden, or spoils (rate times quality)	=	Outflow from alluvium (rate times quality)

"Specific conductance (SC) of water is the parameter examined because of its pertinence to agricultural use. Another characteristic, sodium absorption ratio (SAR) is addressed in a more general manner. No changes in ground-water flow rates are assumed.

"Manipulation of the mass-balance relationship into terms of changes in SC (table II-7) gives the following simplified equation:

$$\Delta SC \text{ in alluvium} = \frac{(\text{inflow rate from alluvium})(\Delta SC) + (\text{inflow rate from coal, overburden, and spoils})(\Delta SC)}{\text{outflow rate from alluvium}}$$

"Values of input were estimated by various methods:

1. Inflow from upstream alluvium:

Table II-7.--Input values used for the Van Voast water-quality model

Parameter	Symbol	Input value(s)
Qal inflow rate	A	20,000 ft^3/day
Qal inflow SC (premining)	B	
Recharge	E	14,500 ft^3/day/mi
Bedrock inflow rate	F	5,000 ft^3/day/mi
Bedrock inflow SC	C	3,300 µmhos/cm
Qal outflow rate	A+E+F	20,000 ft^3/day + 24,500 ft^3/day/mi
Qal outflow SC (premining)	D	
Qal inflow SC (postmining)	b	
Bedrock plus spoils SC (postmining)	c	8,830 µmhos/cm, 9,710 µmhos/cm 8,030 µmhos/cm, 5,120 µmhos/cm 5,860 µmhos/cm
Qal outflow SC (postmining)	d	

$$\underline{\text{Premining}} \qquad\qquad \underline{\text{Postmining}}$$

$$\frac{(A + E + F)D - AB - FC}{E} = \frac{(A + E + F)d - Ab - Fc}{E}$$

$$\Delta SC = d - D = \frac{A(b - B) + F(c - C)}{A + E + F}$$

a) Rate: The component of ground-water flow parallel to the river was calculated from the Darcy equation using an estimated transmissivity and gradient. Transmissivity was estimated to be about 5,000 feet squared per day (ft^2/day); this is equivalent to an average saturated thickness of about 30 feet, and an average hydraulic conductivity of about 170 feet per day (ft/day). Gradient was estimated to be that of the Tongue River Valley as it crosses the petition area (.00128 ft/ft). Valley width used in the calculation was 3,500 feet.

b) Quality: For the petition area, 23 SC values and 21 SAR values for wells completed in alluvium along the Tongue River were found in reports by Montco (1981, table Bc11-1), Woessner and others (1980, p. 178), and Hopkins (1973), and in Montana Bureau of Mines and Geology files. All of them represent ground water south of Ashland; there are no data on alluvial water quality in the downstream third of the petition area. In the upstream two-thirds, the quality of water in the alluvium is diverse; SC values range between about 900 micromhos per centimeter (μmhos/cm) and about 2,900 μmhos/cm, and SAR values range between 1 and 50. Mean SC is 1,490 μmhos/cm; the median is 1,360. Mean SAR is 5.4; the median value is 2.6. No trend of increase or decrease of either paramenter in the downstream direction is discernible, and the assumption is therefore made that there is no change with distance during pre-mining conditions. No input of actual alluvial-water quality is needed in the equation; only additions of SC are calculated.

2. Recharge from surface:

a) Rate: This parameter includes direct infiltration from rainfall and snowmelt, infiltration of runoff encountering the alluvium from tributaries and valley walls, and any other waters not specified in the equation. Rate of input is .25 feet per year (ft/yr) rounded from values measured by Woessner and others (1980, p. 122). Alluvium in the petition area underlies a surface of about 930 million square feet (44.5 miles long and .75 miles wide), and the implied recharge on a daily basis is about 637,300 cubic feet per day (ft^3/day).

b) Quality: Recharge from surface can be expected to be highly dilute. The SC is an unknown, but is assumed not to change after mining.

3. Inflow from coal, overburden, and spoils:

a) Rate: Woessner and others (1980, p. 225) used an inflow rate of 6,350 cubic feet per day per mile (ft^3/day/mi) parallel to the valley in their Logging Creek model. For the Montco area (permit application, 1981), average gradient toward the river is about 40 feet per mile (map V-2-2); from their aquifer-test data (table Bb-6), an average cumulative trans-

missivity of the McKelvey, Nance, and Knobloch coal beds of about 110 ft^2/day appears reasonable. The implied rate of ground-water flow in them is 4,400 ft^3/day/mi. For input to the flow equation, a value of 5,000 ft^3/day/mi is used along each side of the valley within the petition area (44.5 miles), implying a total input from the coal beds and interburden of 445,000 ft^3/day. Postmining flow through spoils is assumed to be the same.

b) Quality: Specific conductance and SAR values for ground waters in coal-bed and interburden aquifers were averaged from 8 analyses published by Woessner and other (1980, p. 434-526) and 17 analyses listed by Montco (table Bc11-1). Average specific conductance was 3,300 µmhos/cm; average SAR was 36.5. Hypothetical spoils-water inputs to the balance were developed for separate parts of the area. SC and SAR values are mentioned in the discussion of each subarea.

4. Outflow from alluvium:

a) Rate: This is the quantity of water discharging from alluvium in the petition area. Most of it discharges to the river; some is lost to evapotranspiration, and some flows northward across the area's northern boundary. The quantity of flow is equal to the sum of flows entering the system, and is therefore 1,102,300 ft^3/day.

b) Quality: The assumption is made that there is no trend of changing quality with distance downstream in the premining system. Postmining changes of SC over downstream increments are calculated with the balance equation.

Sector I

"Sector 1 (fig. II-3) is the part of the petition area upstream from Cook Creek. In this sector, hypothetical mining along both sides of the valley is addressed; valley length is about 10 miles. Quality of postmining ground water that would enter the alluvium from the west side of the valley was estimated from overburden saturated-paste-extract analyses done by the U.S. Bureau of Land Management and Bureau of Reclamation for an EMRIA study of the Prairie Dog Creek area. Analyses of cores from eight holes were used; the top 50 feet of overburden at each hole was considered to be the material that eventually would be at the bottom of hypothetical mine pits, and would therefore be the controlling factor of postmining water quality. Average specific conductance of the top 50 feet of materials in the 8 cores is 5,530 µmhos/cm; SAR calculated from the average sodium, calcium, and magnesium concentrations is 6.6. Quality of postmining ground water that would enter the alluvium from the east side of the valley was estimated using the same technique but with data from cores from five holes drilled by DSL/OSM for the petition evaluation. Average specific conductance was 6,410 µmhos/cm; calculated average SAR was 11.6.

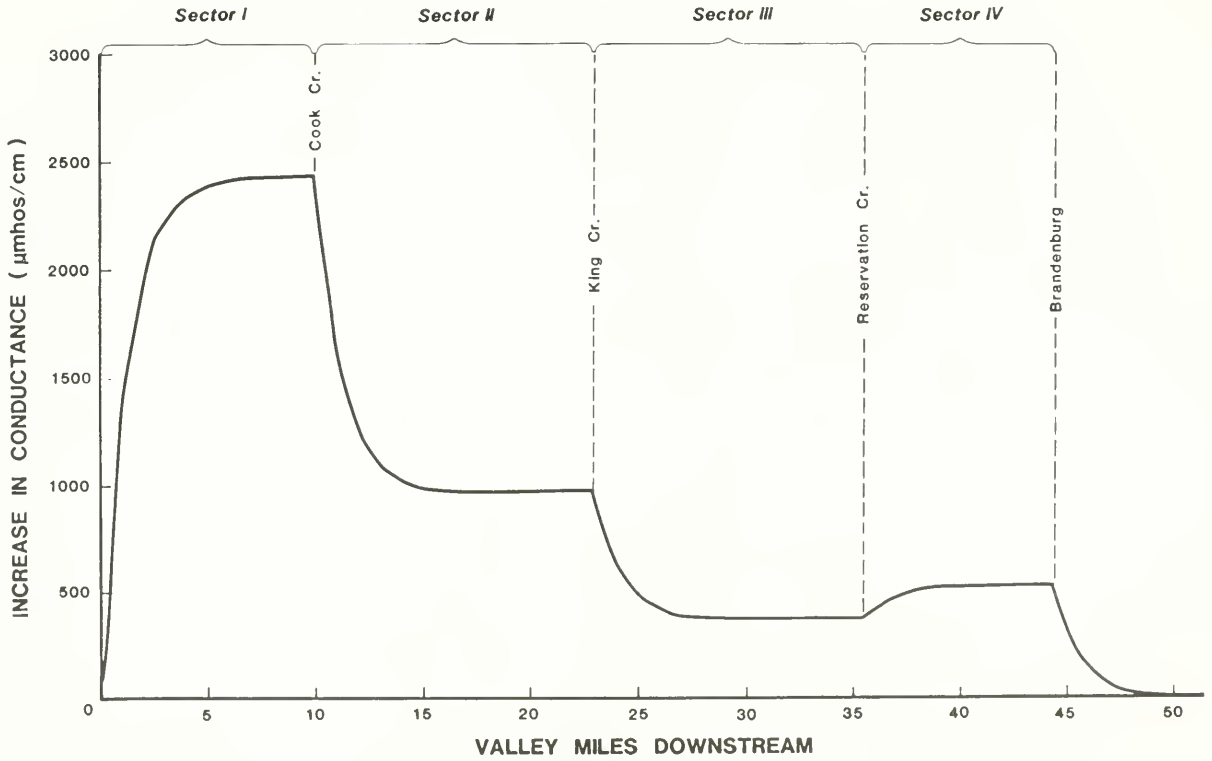

Figure II-3.--Change in specific conductance for four sectors of the Tongue River.

"Postmining ground water flowing through the spoils would have a specific conductance equal to the premining specific conductance plus that contributed by the spoils. Inputs to the mass-balance equation are 5,530 μmhos/cm and 6,410 μmhos/cm, representing an increased salt concentration due to hypothetical mining on the west and east sides of the valley, respectively.

Sector II

"This part of the petition area lies east of the Tongue River and is the same area covered by the proposed Montco mine. It was selected as a subarea because of the high density of data available. Valley reach is about 13 miles. Mining only the east side of the valley is addressed. Quality of hypothetical spoils water was estimated by the same methods used for other sectors. Analyses from the uppermost 50 feet of 69 cores (Montco, 1981, v. 23) show an average specific conductance of 4,730 μmhos/cm; calculated average SAR is 14.3.

Sector III

"This reach of the valley begins at the mouth of King Creek and extends about 11½ miles downstream to the mouth of Reservation Creek, close to the northern boundary of the Northern Cheyenne Indian Reservation. Mining along the east side of the valley is addressed. Quality of hypothetical spoils water was calculated from analyses of cores from seven holes drilled by DSL/OSM for the petition evaluation. Average specific conductance was 1,820 μmhos/cm; calculated average SAR was 6.3.

Sector IV

"This is the downstreammost reach of the petition area, and extends northward from the reservation boundary about 9 miles to the northern petition area boundary near Brandenberg. There are no known recoverable coal reserves west of the Tongue River (fig. III-1, draft document), so mining only along the east side of the valley is addressed. Quality of hypothetical spoils water was calculated from analyses of cores from seven holes drilled by DSL/OSM for the petition evaluation. Average specific conductance was 2,560 μmhos/cm; calculated average SAR was 3.5.

Results

1. Changes in specific conductance (ΔSC):

   The mass-balance equation was applied in two ways. The premining system shows no cumulative effect of downstream inflow from bedrock aquifers, so the analysis was first performed to simulate no cumulative effects of inflow from mined lands. This was done by eliminating downstream flow components in the alluvium. The implied changes in SC values over existing ones are listed below:

Sector I	2,440 µmhos/cm (increase)
Sector II	960 µmhos/cm (increase)
Sector III	370 µmhos/cm (increase)
Sector IV	520 µmhos/cm (increase)

The second analysis acknowledged the possibility of cumulative downstream effects. The equation was solved for 1-mile increments down the Tongue River Valley. For each successive increment, SC changes from preceding increments were input as the assumed down-river flow rate in the alluvium (20,000 ft^3/day). Results are plotted on figure II-3.

2. Sodium adsorption ratio (SAR):

SAR values are ratios, and therefore cannot be averaged and then balanced. Some indication, however, of the changes in SAR in the alluvial water can be obtained by comparing relative values. Most SAR values in the alluvium are less than 5. SAR values in other ground waters currently discharging to the alluvium are much higher; an estimated average is about 36. The spoils waters will contain increased percentages of calcium and magnesium relative to sodium, and will have SAR values generally less than 20. The resulting combining of the three types of water should not substantially increase the SAR values to more than about 10 in most alluvial waters.

Discussion

"Validity of the analysis must be considered in light of the highly simplistic equation used, and its sensitivity to the input factors. The equation assumes uniformity over the entire area, which is certainly not the case. In reality, there probably are conditions in places along the valley that might cause higher postmining SC values than those calculated, and conditions in other places that would allow no change in alluvial-water quality.

"An inherent assumption here is that complete mixing of ground water will occur in the alluvium. This will not happen because of the laminar character of ground-water flow; rather, plumes of waters of different qualities exist there now, and their qualities and distribution will be altered by mining. Increases in specific conductance will likely be greatest in the deepest ground waters in the alluvium; closer to the water table, water-quality changes will be subdued by recharge from the land surface.

"Input parameters have various effects on the calculations. The rate of flow in alluvium parallel to the river (estimated 20,000 ft^3/day) is not a factor in the analysis where no postmining change in SC with downstream distance is assumed. Where progressive downstream change is assumed, different flow rates will give different rates of SC change, but the ultimate increases will be similar.

"Flow rates from coal and overburden aquifers (and subsequently from hypothetical mine spoils) significantly affect the results. For example, doubling them increases the calculated SC changes by about one-third. In reality, flow rates are probably substantially higher than the estimated 5,000 ft^3/day/side/mi in some places, and substantially less in others.

"Hypothetical spoils water quality is a very significant input to the calculations; predicted changes of SC in alluvial waters vary directly with the spoils-water SC. Those used in the analysis appear reasonably representative for an overview of the area, but the diversity of values strongly illustrates the areal variability of soluble salts. Heavily weighting the results toward higher SC values is the presumption that the upper 50 feet of overburden would become the saturated portion of future spoils. In most core analyses examined, the uppermost materials contained far more soluble salts than did lower materials.

"Recharge to the alluvium from surface and other unspecified sources, estimated 0.25 ft/yr or 14,500 ft^3/day/mi, could easily be double that; predicted SC increases in alluvial water would then average about two-thirds of those calculated.

"Acknowledging the frailties of the mass-balance approach and its sensitivities to various inputs, the calculated changes in water quality should be treated only as a generality. Application to real proposed mines without highly specific data would more than likely give strongly misleading results."

CHAPTER III

SUMMARY OF PUBLIC HEARING TESTIMONY, OF INTERVENTIONS, AND OF RESPONSES TO BOTH

A. INTRODUCTION

This chapter summarizes the comments from the interventions and from the public hearings held in Ashland, Montana, on October 21 and 22, 1981. All oral comments have been considered; however, the concerns which duplicate those in the written comments are not repeated in this chapter.

Complete transcripts of the public hearings, and copies of the interventions, are on file at the Department of State Lands offices, at 1625 Eleventh Avenue, Helena, Montana, and 1245 N. 29th Street, Billings, Montana, as well as at the Office of Surface Mining, Brooks Towers, 1020 Fifteenth Street, Denver, Colorado. These are available for review during regular office hours.

B. ORAL TESTIMONY

In accordance with Section 82-4-228 of the Montana Strip and Underground Mine Reclamation Act (SUMRA) and with Section 552 of the Federal Surface Mining Control and Reclamation Act (SMCRA), hearings on the Tongue River petition were held in Ashland, Montana, on October 21 and 22, 1981, to solicit input from the public into the designation process.

Testimony was heard from companies, organizations, and private individuals, most of whom also submitted letters of comment. These letters are reproduced in chapter IV, along with the Montana Department of State Lands (DSL) and Office of Surface Mining (OSM) responses to them.

The testimony from the public hearings is summarized below. For purposes of analysis, testimony has been divided according to subject matter, and designated as "comment." Comments are numbered sequentially (though not necessarily in the order of their presentation at the hearing), and each is accompanied by a response.

Comment 1: The petition was submitted in order to force a look at cumulative impacts of coal mining and to protect property rights. The agencies, in permitting one mine at a time, do not consider cumulative impacts.

Response 1: A permit application for any new coal mine along the Tongue River would probably constitute a major governmental action significantly affecting the quality of the human environment. Therefore, in accordance with both the Montana and the National environmental policy acts, an environmental impact statement (EIS) would probably have to be prepared prior to making a decision. Such an EIS would be required, by law, to analyze the cumulative impacts of the proposed mine.

With regard to cumulative hydrologic impacts, SUMRA, Section 82-4-222(1)(l) and SMCRA, Section 507(b), require a permit application to contain " . . .a determination of the probable hydrologic consequences of coal mining and reclama-

tion operations, both on and off the minesite, with respect to the hydrologic regime, quantity and quality of water in surface- and ground-water systems including the dissolved and suspended solids under seasonal flow conditions and the collection of sufficient data for the minesite and surrounding areas so that an assessment can be made by the regulatory authority of the probable cumulative impacts of all anticipated mining in the area upon the hydrology of the area and particularly upon water availability: Provided, however, That this determination shall not be required until such time as hydrologic information on the general area prior to mining is made available from an appropriate Federal or State agency: Provided further, That the permit shall not be approved until such information is available and is incorporated into the application * * *." Thus, in accordance with State and Federal statutes, rules, and regulations, cumulative hydrologic impacts also must be assessed. The agencies acknowledge, however, that more long-term data are needed to improve any such analysis.

DSL and OSM believe that the most appropriate time to assess the cumulative impacts of mining in an area is before mining occurs. This makes it possible to better protect resources from adverse impacts before they occur; coal companies are likewise spared the need to spend considerable time and money developing mine plans that can't be approved. Of course, it is even more appropriate to assess these impacts before State and Federal coal have been leased in the area in question. However, DSL and OSM must also acknowledge that monetary and, occasionally, time constraints make it impossible to collect adequate data for cumulative impact assessment before the leasing or mine application development stages and thus must make this assessment during permit review.

Comment 2: Many witnesses were concerned about salinity levels in irrigation water during periods of low flow, during which most ranchers must continue to irrigate their crops. There would be a 40-percent reduction in the irrigation season if the waters were too poor in quality to use during August and September.

Response 2: Chapter II updates and improves the analysis presented in the draft document, and evaluates the effect of postmining water on irrigated soils. Such effects are highly variable based on the methods of irrigation, crops being produced, and soil types being irrigated.

Comment 3: Agriculture has long-term importance to the economy of the Tongue River valley. The cumulative expenditure on agriculture, both from the generations of families and from the total number of ranches, has been very high, even though a single ranch, as compared to a mine or railroad, may seem insignificant. Declaring the area unsuitable for mining would protect agriculture. Not declaring the area unsuitable would result in cumulative impacts that would decrease agricultural productivity and threaten the Tongue River as a source of irrigation water. New methods of irrigation have increased both the number of acres now in production and the productivity per acre. The valley has the potential to produce more than just the present livestock and grains; this potential would be threatened by the cumulative impacts of mining. Some 50 percent of the area's income derives from 5 to 7 percent of the Tongue River valley.

Response 3: To the extent that agricultural productivity in this part of the State depends upon the use of, or need for, irrigation water of suitable quality, DSL and OSM agree that ranches along the Tongue River are among the most productive in Rosebud and Powder River Counties and that excess salinity, regardless of the

source, would be detrimental to these operations. Chapter II describes potential effects on agriculture.

Comment 4: Agriculture is a more beneficial use of the land than coal mining.

Response 4: The agencies acknowledge that this is one criterion for designating an area unsuitable. The petitioners did not advance this criterion as a reason for designating the area unsuitable. However, if the determination of substantial loss of water supply or food or fiber products is made, then this allegation could be considered in the decisionmakers' discretionary decision.

Comment 5: Mining would be a short-term source of financial gain, but it would cause a long-term decrease in the area's economy by decreasing agricultural productivity. The coal would not be marketable: the present poor coal market cannot absorb all the coal that could now be mined in the Powder River Basin.

Response 5: Please see chapters I and II.

Comment 6: Is reclamation economically feasible, considering poor coal quality, poor transportation networks, and such other factors as overburden ratios and sulfur content?

Response 6: Coal quality and mining factors are specifically analyzed in chapter I and in response 59 to the Northern Plains Resource Council letter.

Comment 7: The draft analysis neglected the effects of withdrawing municipal and industrial water and of mining upstream. The area should not suffer the same adverse hydrologic impacts as the Colstrip area appears to be suffering.

Response 7: Chapter II refines and supplements the hydrologic analysis presented in the draft document; it also analyzes the effects of municipal and industrial withdrawals and of additional mines upstream from the petition area. This analysis refines the assessment of projected water quality, notably the impact of postmining water quality on agriculture.

Comment 8: There is a market for petition area coal. Petition area soils are suitable for reclamation. No evidence supports the petitioners' allegations of unacceptable postmining water quality.

Response 8: Please see chapter I and II.

Comment 9: The cumulative impacts would be substantially less than the worst-case scenario. Data are inadequate, given the significance of the decision to be made.

Response 9: The actual impacts probably would be less than worst-case.

Comment 10: Other witnesses objected to the entire unsuitability process and the money expended on it. Even after a decision on the petition was made, petitions containing new and different allegations might be submitted by those concerned with the impacts of mining.

Response 10: As the unsuitability process is required by law, neither agency has any choice but to implement it. Additional petitions may indeed be submitted under existing laws and regulations. Please see page I-2.

Comment 11: Considerable testimony was given relative to property rights. Those supporting the petition felt their rights would be affected from the impacts of mining, whereas those not supporting the petition felt their rights would be affected by not mining.

Response 11: DSL and OSM have no authority to determine the constitutionality of the laws and thus cannot respond to questions of property rights. Such a determination falls within the jurisdiction of the courts. DSL and OSM must administer those laws passed by their respective legislative bodies.

Comment 12: Does the petition process seek to designate the cumulative impacts or the land itself as unsuitable?

Response 12: The petition process may designate lands in the petition area as unsuitable for mining. The cumulative impacts of projected mining would be the basis for making such a decision.

Specific technical statements have been divided for analysis into two sections--soils and hydrology--and are presented below.

1. Soils

Comment 13: Insofar as possible, the designation decision must identify those places where special handling and reclamation technologies would have to be used.

Response 13: Currently, DSL/OSM do not have the detailed, site-specific overburden and soil information within the petition area (except for Montco's King Creek site) to determine where special handling or reclamation techniques might be necessary. Current data do suggest that the part of the petition area south of Ashland generally has less high-quality overburden than the part north of Ashland and would thus be more likely to need special handling techniques. However, the need for special handling would be evaluated on a site-specific basis, using equivalent reclamation criteria regardless of where in the petition area specific mine plans might be proposed. DSL has received a permit application from Montco for mining in the King Creek area south of Ashland. This application contains detailed overburden and related mining plan information. As a part of its responsibility, DSL is presently evaluating whether special handling is needed in the King Creek area. Likewise, for other parts of the petition area, upon receipt of a permit application containing more detailed site-specific information, it is possible DSL would determine that, for one reason or another, a particular area could not be mined or successfully reclaimed.

Comment 14: Some 23 percent of the petition area is overlain with shallow (6 inches or less) soils which would require "special, complicated, time-consuming, and expensive mining procedures."

Response 14: Further evaluation of the shallow soils is presented in chapter II of this volume. Also, please refer to the third full paragraph on page IV-33 of

the draft document and to the revision of page IV-33 in chapter II, which discusses the prerogative of a company to propose the use of suitable overburden in place of, or along with, surface soil. Because suitable overburden materials exist in the petition area, this is a possible option. However, this is not to say that a company would propose to use such overburden or that DSL/OSM would approve such a plan should a company propose it. This possible alternative would depend entirely on the site-specific mining and reclamation plan proposed and its compliance with the Montana act and rules.

DSL/OSM, in responding to the petition allegations regarding shallow soils, deal (in chapter II of the draft document) with the question of the minimum depth of soil that could be salvaged. Mr. Opper's affidavit contended that soils less than 18 inches in depth were probably too shallow for use in reclamation. In effect, what he said was that such soils could not be salvaged and, thus, could not be considered in evaluating the quantity of suitable surface soils that would be available for reclamation purposes. Our response to this allegation is that there is considerably greater acreage containing salvageable surface soil material than Mr. Opper asserted. (Please refer to the first complete paragraph on page IV-33 of the draft document.)

The question of whether 6 inches of soil is adequate for revegetation as raised at the hearing is an entirely different question, because neither the petition nor the draft document stated that only 6 inches of soil were available for reclamation within the petition area. The draft document said that soils as thin as 6 inches could be salvaged. Thus, all suitable soils and overburden should be salvaged to contribute to the total pool of useful soil or other suitable materials available for reclamation.

Comment 15: The draft document discussed recoverability instead of reclaimability.

Response 15: The question of reclaimability involves the question of recoverability, for if sufficient soil materials can or cannot be recovered, then that fact relates directly to the question of reclaimability.

Comment 16: Although reclamation as discussed in the draft document appears promising, the long-term trend is unknown.

Response 16: DSL/OSM certainly concur that the long-term trends of reclamation in relation to revegetation, subsidence, and landscape stability have not been documented. Monitoring at existing mines in the State is now documenting changes that take place over a period of time after mining. The monitoring includes such things as the periodic examination of vegetation, subsidence activity, and potential soil salt and sodium movements (as discussed on pages IV-35 and IV-36 of the draft document).

Comment 17: The reclamation and soils analyses in the draft document are confusing.

Response 17: The main body of the draft document dealing with the feasibility of reclamation and soil/overburden quality did not specifically state that reclamation success was certain for the petition area. It did say that sufficient evidence was not available to conclude that revegetation was unfeasible. Please

refer to the revision of pages IV-26 and IV-27 of the draft document, presented in chapter II of this document.

Comment 18: Why was the Bureau of Land Management's (BLM's) report was reprinted in appendix C of the draft document? Why did the draft document sometimes disagree with the BLM report?

Response 18: DSL/OSM included this report because it was the BLM's official response to the Tongue River petition; it was not specifically utilized in the main body of the draft document dealing with soils and reclamation. Nor was the draft document analysis intended to agree or disagree with the BLM analysis or policy recommendations. There are differences between the analyses, and it was not our intent to reconcile these differences. The draft analysis is based on the best information available, and the BLM letter was reproduced so the public could have access to it.

Technical testimony submitted by Richard Opper supplemented his written comments. Thus, his testimony is reproduced to a greater degree than is any other testimony. Mr. Opper's comments are summarized as follows:

Comment 19: Shallow soils, 18 inches or less, dominate 59 percent of the area investigated and are an obvious obstacle to reclamation. Instead of acknowledging this, the agencies offered mitigations such as the use of rocky soils.

Response 19: We acknowledge that soils 18 inches deep (20 inches in the draft document) dominate 59 percent of the petition area. No documentation or arguments have been advanced that such soils would impede reclamation. A soil depth of 18 inches has no particular significance from the standpoint of reclamation. Soils as thin as 6 inches could be salvaged.

The draft document discussed the possible use of rocky soils in connection with salt and sodium problems (pages IV-24 and IV-26 of the draft document). It did not advocate the use of rocky soils to mitigate reclamation problems due to shallow soils.

Rocky soils might, however, be appropriate for some reclamation. The Montana Act requires in part that an operator "prepare the soil and plant such legumes, grasses, shrubs, and trees as are necessary to establish on the regraded areas and all other lands affected, a diverse, effective, and permanent vegetative cover capable of. . .feeding and withstanding grazing pressure from a quantity and mixture of wildlife and livestock at least comparable to that which the land could have sustained prior to the operation * * *." DSL has interpreted this to mean that such species as ponderosa pine and skunkbush sumac are locally important components of the vegetative community that must be reestablished if disturbed by mining. In natural landscapes these species typically occur on rocky or sandy soils. Accordingly, such substrates would probably have to be used to reestablish reproducing stands of these species. Such materials have been salvaged for this very purpose on two existing mines in the State. Because of extensive stands of ponderosa pine in the petition area, it can be expected that similar salvage of rocky soils would be required of future coal mining applicants.

Comment 20: There is a danger in using spoil material to construct surface and subsurface plant media: a surface reclamation problem is commonly traded for a subsurface problem.

Response 20: The possibility of using suitable overburden along with or in place of topsoil cannot be ruled out because Montana's rules (ARM 26.4.703) provide for this alternative. However, it does not follow that a proposal by a company to use such material will be approved. We would, of course, look at the use of such material in relation to an overall reclamation plan. We would evaluate the effects on ground water and other resources of the area to be affected by utilizing suitable overburden material for surface reclamation.

Comment 21: Long-term ground-water quality and the stability of the post-mining landscape are important concerns. If 2 to 3 meters of suitable spoil materials must be salvaged to construct suitable surface environment, there will be major problems supplying adequate material to buffer the aquifer as well.

Response 21: DSL/OSM certainly agree that long-term ground-water quality and the stability of the postmining landscape are reclamation concerns. The draft document did not consider whether the petition area has enough suitable spoil both to reclaim the surface environment and to adequately buffer aquifers, because this was not an allegation.

The difficulty of reestablishing both the surface and the aquifers would depend not only on the quantity and quality of soil and overburden at each minesite but also on the ground-water regime. Reclamation design for both the land surface and the aquifers at each minesite will have to consider the specific mine plan and the detailed information on soils and overburden for that site.

Comment 22a: The draft document relies on Montco data to refute the allegation regarding smectite (montmorillonite) clays and then admits the same data are meaningless.

Response 22a: We constructed two scenarios from Montco's data on clay mineralogy in surface soils data (as cited in the petition). The first scenario showed that the data did not indicate that smectite (montmorillonite) clay dominated the samples analyzed. The second scenario indicated that the data themselves were somewhat suspect because of certain analytical shortcomings that were discussed on pages IV-30 and IV-31 of the draft document. The data cited in the petition do not substantiate the allegation that smectite (montmorillonite) dominated the samples for either scenario.

Comment 22b: Mineralogy of soils cannot be equated with mineralogy of the overburden; thus, the document should not use overburden mineralogy to disprove allegations about smectite (montmorillonite) in the soils.

Response 22b: What DSL/OSM attempted to do with the Montco overburden clay mineralogy data was to point out some additional direct information that had not been cited in the petition. All information regarding smectite (montmorillonite) clays in the petition area was presented, regardless of whether it was from surface soil or from overburden samples. If the expressed interest is solely in reference to surface soils, then please refer to the conclusion of our response 22a above.

Comment 23: DSL and OSM must reevaluate the Soil Conservation Service (SCS) soil survey data, as the Powder River County Survey shows 14 of the 15 soils classed by clay types had smectites (montmorillonites).

Response 23: In reponse to this comment, we have summarized the acreage underlain by strippable coal reserves (as defined in the draft document) that were characterized by soils dominated by smectite (montmorillonite) clay minerals as indicated in the SCS soils surveys for both Powder River and Rosebud Counties. A total of 49,777 acres of land within the petition area is underlain by strippable coal reserves. (Note: The methods of calculating acres of recoverable coal for the soils and for the hydrology sections varied slightly, resulting in a 389-acre difference, which is not a significant deviation.) Of this total, 13,136 acres, or 26 percent, has smectite- (montmorillonite-) dominated soils. The only significance to this figure would be in relation to the proportion of the smectite (montmorillonite) soils that have very high total clay contents and/or are sodium affected; we do not have such information. The other pertinent information would be the quantity of suitable soil material that is represented by the other 74 percent of the area that is occupied by soils not dominated by smectite (montmorillonite) clay minerals. This kind of information would best be supplied by much more intensive characterization on a site-specific basis.

Comment 24: EMRIA studies showed 60 percent of the soils, by volume, that were tested in this report were saline, yet 54 percent of the soils were classed as well suited for reclamation. DSL/OSM have relied on these conclusions and not on the data.

Response 24: Please refer to the revised page IV-26 of the draft document, presented in chapter II of this document. The observation implicit in the discussion of the EMRIA studies on Otter Creek was that the data showed highly variable quantities of suitable surface material (from 0 to 60 inches). Also, some sites appear to have more suitable material than others. Because of the limited acreage covered by the EMRIA data (all or parts of eight sections of land in the whole Otter Creek drainage) and the very limited data on at least three of the sites (Newell/28, Chromo/4, and SHY/6), more intensive characterization would seem necessary. Finally, your calculation that 60 percent of the soils in the Otter Creek East study area have electrical conductivities (EC's) greater than 4 millimhos/centimeter (mmhos/cm) is not the key datum in our estimation. The most important information is how much suitable soil is available in the area of concern. DSL and OSM issued a permit to Spring Creek Coal Company in 1979 to mine an area dominated by soils that commonly have saline/sodic conditions at least somewhere in the profiles. However, the quantity of suitable material (both soils and overburden) available for reclamation was determined to be adequate in the case of the Spring Creek mine.

Comment 25: The draft document should have discussed the BLM tract profiles, which rated 26 to 43 percent of the soils in the petition area as unsuitable for plant growth.

Response 25: In preparaing the draft document we reviewed all the BLM tract profiles which you listed, as well as those for Ashland (Decker-Birney). The evaluations in these profiles are very broad-based and apparently did not consider the EMRIA studies published earlier on these same tracts (those studies were not cited or referenced anywhere in relation to soils). Also, the profiles apparently did not evaluate salts or sodium levels in the soils (they contained almost no indication of salts or sodium as hazards for soil suitability purposes). Finally, they apparently did not evaluate overburden quality in these tract profiles. Therefore, we did not use these profiles in our evaluations.

Comment 26: The draft document incorrectly assumed Dollhopf's West Decker study to be applicable to the entire petition area.

Response 26: We regret any confusion created by the discussion concerning Dollhopf's study at West Decker. We did not intend to suggest that this study would apply to the whole petition area. Our intent was to discuss all information available to us that we felt would be pertinent to the issues at hand.

Comment 27a: DSL/OSM drill hole data show that 50 percent of the overburden, by volume, which was investigated is saline and/or sodic with high levels of exchangeable sodium being the bigger problem.

Response 27a: Our conclusion concerning the DSL/OSM overburden data is on page IV-27 of the draft document and on the revised page IV-27 in the "Revisions to Chapter IV, Soils, of the Draft Document" section of chapter II. We discussed these data along with other relevant data on the basis of subareas within the petition area.

Comment 27b: Conditions are ripe for sodium migration to occur on a large scale in the petition area. Furthermore, the conclusion that adequate volumes of suitable materials are available needs to be reevaluated in light of both deep burial requirements to mitigate sodium migration and the need to buffer the aquifer from saline and/or sodic soils.

Response 27b: We indicated in our summary on overburden suitability on page IV-27 of the draft document that significant volumes of suitable overburden occur within the petition area. The overall thickness of suitable material typically ranges from 15 to 65 feet. However, data on some holes indicated little or no suitable material. Data on other holes indicated there may be questions of the accessibility of the suitable material for actual use in reclamation. Evidence at this time does not appear to support the contention that the quantity of suitable material identified to date is insufficient for mitigating the problem of sodium migration. As far as recreating aquifers is concerned, please see response 21 above.

2. Hydrology

Comment 28: Postmining crop productivity would be reduced. Reclamation would rely on irrigation.

Response 28: Ongoing research suggests no reason to believe that productivity would be reduced. We do not have any direct information on reclamation of crops in Montana because, to date, no reclamation plans at existing mines have proposed the planting of crops. Recent reclamation on existing coal mines in the State has, by and large, not relied on supplemental irrigation water for reestablishing vegetation, except possibly for ponderosa pine and such warm-season grasses as blue grama.

In drought years, the revegetation of newly seeded areas may fail. (This apparently happened on areas being reclaimed at two mines in Montana, both of which required reseeding.) Fall seeding reduces this risk by allowing young plants to use the spring moisture, whereas seeding in the late spring risks dry conditions for the rest of the growing season.

If, for a site-specific area, supplemental or primary irrigation water was necessary to make a proposed reclamation plan viable under the Montana and Federal acts, that reclamation plan would be evaluated on the basis of required irrigation, giving due consideration to the availability of suitable-quality water and to any adverse effects that might result from irrigating the mined land.

Comment 29: Montco plans to irrigate annually.

Response 29: Montco's permit application to the Montana Department of State Lands discloses no such a plan. The company has proposed some limited irrigation for perhaps the first year or two of reclamation on specific areas to aid reestablishment of trees and directly replaced sod.

Montco's 24-year mine plan outlined in the application indicates little disturbance of presently irrigated acreage--the only disturbance evident would be caused by the rail loop at the north end of the project area. Thus, resumption of irrigation during reclamation of previously irrigated land would be limited to that acreage affected by the loop--a total of about 4 acres.

If a considerable amount of irrigation was being proposed by Montco for reclamation, it would certainly be a factor regarding soluble salt movement and potential impacts on the Tongue River. However, no current plans to do so have been provided in Montco's application other than those described above.

Comment 30: Water wells would be destroyed. Who would replace such wells? Who would maintain the new wells?

Response 30: Montana law requires that a coal company must replace a rancher's water supply which has been documented to be lost or damaged by a mining operation (82-4-253 MCA; 30 CFR 816.54). The law requires that water of like quantity, quality, and duration be replaced. Such a replacement could include the drilling of deep wells. The coal company is responsible for providing the replacement water supply. The rancher is responsible for operating and maintaining it.

Comment 31: Lower water quality would be disastrous in the long term to alkaline irrigated fields.

Response 31: DSL/OSM have refined the assessment of water quality on irrigated land in the petition area. (See chapter II.) We appreciate and have utilized the soil analysis provided.

Comment 32: The quality and quantity of postmining ground-water supplies is also an important issue.

Response 32: Although some water sources will be destroyed, aquifers tend to reestablish in the backfilled pit. These aquifers are highly variable in quality due to the overburden chemistry. DSL/OSM feel that the modeling approach used for predicting postmining water quality represents the best method available to date for such predictions. Possible contamination of offsite ground water is addressed in both the draft and this final document as the projected total dissolved solids (TDS) levels are for the aquifers downgradient from the mine, and, ultimately, for the surface water system. Any lowering of the ground water from mining would be short-term and would result from dewatering operations at the

mine. Water levels would return to normal following completion of any such dewatering operation.

Comment 33: Both the input and the output data for the computer models are questionable; specifically, the output data cannot be considered "facts."

Response 33: In order to assess the petition, DSL/OSM had to predict the impacts of reasonable mining scenarios. Perhaps the most rigorous way to predict such impacts for water quality is to use state-of-the-art computer models. (See the "Revisions to Chapter IV, Hydrology, of the Draft Document" section of chapter II.) As input to those models, we used our best professional estimates of mine locations and acreages; those estimates have now been refined by public review of the draft document. The output of the models we regard as the best possible prediction of water-quality impacts--but certainly not as "facts."

Comment 34: The relationship between soils and hydrology is also questionable.

Response 34: Some information is presented in the draft document under the discussions of "Reclamation Failure/Increased Sediment Loads" and "Saline-Seep Development." Additional information is presented in chapter II of this document on the effect of postmining water on irrigated soils. Such effects are highly dependent on the methods of use and on the crops being produced.

Comment 35: What is "state-of-the-art" in reclamation that will make the replacement of wells, springs, and ground-water aquifers technologically feasible? What would be the cost of such restoration of wells and springs?

Response 35: Currently, the aquifers are reestablished in the rubble zone on the pit floor. DSL and OSM have the authority to require special handling, as necessary, for aquifer reestablishment. The cost of developing such an aquifer into specific water sources would vary with specific site characteristics. Currently, Nerco is proposing to mine and then re-create a subirrigated area along South Fork Spring Creek in the Spring Creek mine area. They plan selective salvage and replacement of surface materials.

Comment 36: Mining would disrupt the essential hydrological functions of the Tongue River alluvial valley floor.

Response 36: The essential hydrologic balance in certain areas may not be maintained; however, it is beyond the time allowed by the petition process to identify those areas. Section 82-4-227(3)(a) of SUMRA provides for the protection of the hydrologic balance as part of the analysis of site-specific permit applications.

Comment 37: Was Wyoming's share of water under the Yellowstone compact considered?

Response 37: Yes. The model assumes that the Tongue River Reservoir will be able to supply the flows used in the analysis with Wyoming removing its share of the Tongue River.

Comment 38: Montco contended its operation would cause a 16-percent increase in TDS in the alluvium as compared to the 50- to 100-percent increase presented in the draft document.

Response 38: DSL/OSM did not specifically analyze the Montco operation. Such a difference is possible. The Montco evaluation covered only its mine area, whereas the USGS model was used with very intensive mining levels projected to cover the entire petition area.

C. INTERVENTIONS

Interventions to the Tongue River petition were received from Burlington Northern, Cities Service, Consolidation Coal Company, Mobil Oil Company, Montco, Nerco, Inc., Peabody Coal Company, Wesco, and several individuals. Most of these interventions addressed legal issues beyond the scope of this analysis. Burlington Northern, Cities Service, Nerco, Inc., and Peabody Coal, submitted detailed literature reviews with some new data. All new data submitted were reviewed to determine if they changed DSL/OSM's analysis. Where new data did change the analysis, that fact is mentioned either in the response to comments (chapter IV of this document) or in the revised analysis (chapter II of this document).

Specific allegations in the interventions are summarized below. The draft document, as revised in chapter II of this document, responds to both the petition and the intervention petitions.

Comment 39: Current surface coal mining in the Tongue River watershed has had a slight effect on the quantity and quality of surface flow in the Tongue River; although hydrologic principles indicate a potential for impact, measured effects have been small. For the ground-water system, mining would have little effect on the regional flow pattern; the quality of flow would be variable but within the general range of existing Tongue River Member aquifers.

Response 39: DSL and OSM agree that individual mines have had little effect on the quantity or quality of surface water, with proper mining and reclamation techniques. However, if reclaimed landscapes proved less stable than the pre-mining landscapes, the quality of surface waters would decrease.

DSL and OSM also agree that reclaimed spoils have highly variable aquifer characteristics and that on an individual mine basis the water quality would be within the general range of the existing Tongue River Member aquifers. However, in order to evaluate the petition, the cumulative impacts of several mines on ground water must be considered.

Comment 40: One intervenor stated that, within the Otter Creek watershed, the ground water flowing through the coal seams and overlying strata contributes less than 20 percent of the flow to Otter Creek. Water in these seams is seldom, if ever, used by local residents because of its extremely poor quality. Removal of the coal and overlying strata and replacement with appropriately sorted overburden will not affect the flow quantity in Otter Creek or the quality of ground water available for land use.

Response 40: DSL and OSM did assume that the ground-water flow quantity into Otter Creek would not be changed; however, the quality would change as detailed in the draft document. Current work indicates that postmining ground water is of poorer quality mainly because of the increased leaching in the replaced spoils.

Comment 41: Otter Creek supplies less than 1 percent of the mean annual flow of the Tongue River. Considering the small amount of flow contributed by discharge from the coal seams, the percentage of flow to the Tongue River contributed by coal seam flow in the Otter Creek area of interest is very small, less than 0.2 percent. Variations in ground-water quality or quantity as a result of mining coal seams in the Otter Creek reserve block would most likely not be detected in the Tongue River.

Response 41: High TDS levels in water discharged from Otter Creek are indeed diluted. However, TDS levels in the Tongue River would be increased, and this increase may, on a 30-day low-flow basis, become critical as flow rates drop in the river during August and September. The increase would be low but detectable.

Comment 42: Normal variations in the quality of water in the Tongue River as measured by TDS and total suspended solids are very large, due to natural changes in runoff and seasonal climatic variations. TDS concentrations have been shown to increase 200 percent as a result of removal and return of irrigation water along the Tongue River. Variations in quality of tenths of 1 percent caused by mining, even over the entire minable area of the Otter Creek drainage would be undetectable within the "noise" of natural fluctuations.

Response 42: The USGS water quality model used in our analysis indicates that cumulative mining impacts would increase TDS levels more than tenths of 1 percent and thus would be detectable above the "noise" of natural fluctuations. Please see chapter II.

Comment 43: Economic reclaimability depends on the cost of coal removal, its sale price, and the cost to return the area to acceptable land use. This balance must be favorable to start mining. The cost of removal depends mainly on the ratio of overburden thickness to coal thickness. The Otter Creek reserve and a large portion of the recoverable coal in the petition area have lower ratios and, therefore, lower removal costs than much of the coal being mined in Montana today. The sale price is governed by the market, but a coal company will generally not mine unless the costs of removal and reclamation are less than the sale price. Cost of reclamation depends on the cost of mitigative measures to return the surface to an acceptable revegetated state and the subsurface to conditions which will not adversely affect the ground water. Adverse effects on ground water can be considered those which (a) significantly deteriorate waters utilized extensively for land use support or (b) significantly alter the quality of adjacent surface water bodies. As discussed below, extensive or unusual and costly mitigative measures are not anticipated to accomplish these results in the Otter Creek area.

Comment 44: Some intervenors submitted specific data on their properties. For instance, over 80 percent of the soil types within one area of interest have an average EC (electrical conductivity) of less than 4 mmhos/cm; less than 20 percent of these soils have an average EC of 2 to 8 mmhos/cm, with salvageable topsoil of less than 20 inches and chemically favorable overburden zones occurring

to depths in excess of 180 feet. Such data are incorporated into the DSL/OSM total results and are not presented separately.

CHAPTER IV

COMMENTS AND RESPONSES

This chapter contains copies of the letters received in response to publication of the draft document. The letters are organized alphabetically and by category under government agencies, companies, and individuals and organizations. Where a letter raises a question, or issue, the question is identified by number and the response to it is given on the same page. All letters are available to the decisionmakers, each of whom is charged with making the decision--the Commissioner, Montana Department of State Lands, on the non-Federal lands at issue and the Secretary, Department of the Interior, on the Federal lands--on the Tongue River unsuitability petition.

Commentors who expressed opinions or concerns about the Tongue River Railroad are referred to the Interstate Commerce Commission's environmental report which will be made available in the spring of 1982. A brief summary of of what is known of the railroad is given in chapter I.

Comments that raised legal arguments concerning the procedures used in the development of the draft document and in the petition process in general, those which questioned the legal rights of various parties, and those which challenged Section 82-4-228 of the Montana Strip and Underground Mine Reclamation Act (SUMRA) and Section 522 of the Surface Mining Control and Reclamation Act (SMCRA) were not responded to, inasmuch as they are beyond the scope of this document. No comments were received after the close of the public comment period. All comments have been considered in the preparation of this document, which has been altered, as appropriate, to accomodate certain of these. In addition, specific responses to all substantive written comments are provided below.

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DEPARTMENT OF COMMERCE

TED SCHWINDEN, GOVERNOR

1424 9TH AVENUE
CAPITOL STATION

STATE OF MONTANA

HELENA, MONTANA 59620

October 26, 1981

MEMORANDUM

TO: Department of State Lands

FROM: Wallace J. Olson, Administrator, Economic and Community Development Division

RE: Tongue River Petition and Evaluation

We have reviewed the draft document for the above petition and evaluation.

We feel that the study and comments in Chapter III would have been more complete if it had addressed the economic impact on the immediate area of the study and the State of Montana. 1

We hope that future projects of this type will include this wider range of study.

WJO/ke

1 See change to text for "Social, Economic, and Community Services Background" (from chapter II of the draft document) in chapter II.

STATE OF MONTANA

DEPARTMENT OF
FISH AND GAME

[illegible], MT [illegible]
Oct[illegible] [illegible], 1981

Mr. [illegible], Director
Department of Natural [illegible]
[illegible]
Helena, MT [illegible]

Mr. [illegible], Director
Department of State Lands
Helena, MT 59601

Dear [illegible] and [illegible],

We have reviewed the Tongue River petition evaluation document that was drafted by the Department of State Lands dealing with salinity and mining in the Tongue River Basin. A copy of our review is attached for your information.

From our perspective, this analysis has impacts that relate to several projects in the Tongue River Basin. First, and most obvious, is the coal mining which it addresses directly. The second issue that we believe is relevant is the study going on relative to Tongue River Dam.

1 Our department continues in the position that Tongue River Dam must be repaired or restored, but we believe this particular analysis indicates that further depletion of the Tongue River would compound the salinity issue raised by this petition. We ask that it be addressed, particularly when contemplating an aggressive industrial water marketing option for Tongue River Dam.

2 It is our feeling that adequate diluting instream flows must first be assured before we actively seek water allocation options that might further deplete this system. We ask that consideration be given this point when Tongue River feasibility options are reviewed.

Sincerely,

James W. Flynn
Director

JWF/JAP/sd

Enc

1 Future industrial/municipal withdrawals have been included in the final analysis. Please refer to chapter II.

2 The analysis used considered that, under ideal conditions for low flow, the instream reservation of 75 ft^3/sec would be supplied to the Tongue River (draft document, p. IV-6 through IV-16). It is recognized that flows will occur below the instream reservation; however, the USGS water-quality model cannot predict flows below this level using the proposed increased storage capacity of the Tongue River Reservoir.

STATE OF MONTANA

DEPARTMENT OF FISH, WILDLIFE AND PARKS

Office Memorandum

TO : Jim Flynn, Attn: Bob Martinez

DATE: 10-13-[illegible]

RECEIVED

OCT 14 [illegible]

ENVIRON. RESOURCES

FROM : Keith G. Seaburg, By: Al Elser

SUBJECT: Tongue River Petition Document

I have reviewed the Tongue River, Montana, Petition Evaluation Document (Draft) and would like to offer the following comments.

While the Petition addresses water quality as it relates to agriculture, I feel it is important to look at the changes as they may affect the aquatic ecosystem. Total dissolved solids (TDS) is a measure of the salinity of water. TDS is a water quality parameter that changes with changing streamflow and dilution of irrigation returns. There is no absolute upper limit in TDS for domestic water, however, the Public Health Service recommends that waters with TDS greater than 500 mg/l not be used for drinking if other, more potable supplies are available. Livestock are less sensitive to salts than humans. Plants vary, but in general are much more sensitive than animals. Freshwater communities, because of osmotic mechanisms are sensitive to salinity. The following table compares salinity hazards for irrigation water and fresh-water communities.

TDS (mg/l)	[illegible]	Freshwater Community Hazard
< [illegible]		low, healthy, mixed aquatic community
400-7[illegible]	Low, [illegible] plants [illegible] conditions.	moderate, some organisms suffer competitive disadvantages
700-13[illegible]	Medium; [illegible] and [illegible]	high, threshold range for [illegible] comm.; [illegible]
[illegible]	[illegible]	
> [illegible]	[illegible]	

From: [illegible] Draft EIS for Water Reservation Applications, Vol. I, 1978, MT DNRC, pg 55-56.

Thus it appears that the salt sensitivities of irrigated crops and aquatic systems are similar. Based on the above table, TDS levels greater than 700 mg/l can be assumed to have an impact on the aquatic community and levels in excess of 1350 mg/l a great impact.

The DSL and WQM document utilized salinity, TDS and flow modelling to predict the impacts of increased agricultural development and mining on the river. On page IV-7, paragraph 1, it is stated that when the predicted increase in TDS is added to the mean TDS level for the stream, the result is a range (after mining) of 1,687 to 3,506 mg/l TDS. These TDS levels present a very high salinity hazard for irrigation and could be expected to have a strong influence on the aquatic community as well.

Page IV-10 (paragraph 1): Computer runs incorporating more intensive mining showed little impact when considering mean streamflow. However when streamflows were reduced to the instream reservation (75 cfs), the salinity hazard for irrigation would be high to very high for the entire growing season. This could be expected for the aquatic community as well. Thus it is apparent that if streamflows other than mean levels were considered, the TDS levels would probably be critical. A more meaning evaluation would be based on low flows rather than mean flows.

Page IV-10 (paragraph 2): Intensive mining and increased agriculture development would result in projected increases of TDS significantly over the salinity hazard for irrigation. Again an impact on the aquatic community would also result.

Page IV-10 (naragraph 6): Document states that preliminary projections indicate that mining will have the greatest effect on the Tongue River during periods of low flow (August through September) or when water levels are reduced to the instream flow reserved for aquatic life. Thus it is apparent that mining and agriculture will have an impact on the aquatic community of the Tongue River. The evaluation of the effects of increased development (maximum mining and irrigation) along the Tongue River indicates the quality of flow in the river would be considered a high to very high salinity hazard for irrigation (August through September). Aquatic communities would also suffer.

Since only mining in the vicinity was considered, the increased mining upstream could also be expected to alter the TDS levels in the river. Changes in population levels and their demands for water (and changed quality of return flow) would be expected to influence TDS levels. If these added pressures were considered, it appears logical that even greater significant changes in TDS could be expected.

Page IV-17: The question of storage and release patterns from the Tongue River Dam now and in the future is raised. In paragraph 3, the conclusion is drawn that a modified Tongue River Dam would have greatest impacts during low flow period (August through September). The DNRC has committed themselves to an operational plan on the existing dam which insures low storage prior to spring runoff. This reduces the chance of failure. Thus depending on runoff conditions and how much water is stored in the reservoir, it is very probable to expect periods of reduced flow, perhaps approaching an in-flow - out-flow situation. With reduced flows, TDS levels will become even more critical.

Another factor that needs to be considered is that with a new reservoir with increased storage capacity, flows could be reduced even further. Since the proposed dam will have an increased capacity, it will take more to fill it resulting in lower flows, particularly during the spring.

In summary, TDS levels are predicted to increase in the Tongue River as a result of mining and agricultural practices. The TDS increases will admittedly impact the irrigation potential therefore the aquatic community will also be impacted. I think this should be addressed in the document. TDS levels should be evaluated in terms of minimum flow levels rather than mean flows. Worse-case scenarios would show a true picture of potential impacts. Tongue River Reservoir management present and future should also be re-evaluated and considered in the discussion of TDS. Varying levels of storage and/or releases will alter the concentrations of TDS.

3

3

Analysis under conditions of low flow would represent a worst-case in terms of the potential impact of varying levels of storage and/or release on concentrations of TDS. Please see response 8, Northern Plains Resource Council letter.

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

STATE OF MONTANA

September 30, 1981

Ms. Sandi Johnson
Montana Department of State Lands
Capitol Station
Helena, Montana 59620

Dear Ms. Johnson:

1 The Water Quality Bureau would like to clarify some misinformation that appeared in the draft Tongue River, Montana, Petition Evaluation Document regarding water quality classification of the Tongue River. The document (page IV-2) states that "Water quality in the Tongue River from the Wyoming boundary to the Yellowstone River is classified as B-2e...". This is incorrect. The Tongue River is classified B-2 from the Wyoming boundary to Prairie Dog Creek near Birney. Here the classification changes to B-3 downstream to the Yellowstone River. A copy of the State of Montana Surface Water Quality Standards is enclosed for your information.

Sincerely,

Steven L. Pilcher

Steven L. Pilcher, Chief
Water Quality Bureau
Environmental Sciences Division

SLP:yf
Encl.

AN EQUAL OPPORTUNITY EMPLOYER

1 Thank you; the correction has been made to the final document text.

PROVISIONAL

Rule 16.20.305 Water Supply

16.20.306 Filling Points

16.20.307 Chemical Treatment of Water

Sub-Chapter 4

Public Water and Sewer Plans, Cross Connections, and Drilling Water Wells

Rule 16.20.401 Plans for Public Water or Sewer System

16.20.402 Cross Connections

Rules 16.20.403 and 16.20.404 reserved

16.20.405 Drilling Water Wells

Sub-Chapter 5 reserved

Sub-Chapter 6

Surface Water Quality Standards

Rule 16.20.601 Policy

16.20.602 Application and Composition of Surface Water Quality Standards

16.20.603 Definitions

16.20.604 Water-use Classifications -- Clark Fork-Columbia River Drainage Except the Flathead and Kootenai River Drainages

16.20.605 Water-use Classifications -- Flathead River Drainage

16.20.606 Water-use Classifications -- Kootenai River Drainage

16.20.607 Water-use Classifications -- Missouri River Drainage Except Yellowstone, Belle Fourche, and Little Missouri River Drainages

16.20.608 Water-use Classifications -- Yellowstone River Drainage

16.20.609 Water-use Classifications -- Little Missouri River Drainage - Belle Fourche Drainage

Rule 16.20.610 Water-use Classifications -- Hudson Bay Drainage

16.20.611 Water-use Classifications -- National Park, Wilderness and Primitive Area Waters

Rules 16.20.612 through 16.20.614 reserved

16.20.615 Specific Surface Water Quality Standards -- General

16.20.616 A-Closed Classification

16.20.617 A-1 Classification

16.20.618 B-1 Classification

16.20.619 B-2 Classification

16.20.620 B-3 Classification

16.20.621 C-1 Classification

16.20.622 C-2 Classification

16.20.623 E Classification

16.20.624 C-3 Classification

Rules 16.20.625 through 16.20.630 reserved

16.20.631 Treatment Standards

16.20.632 Operation Standards

16.20.633 Prohibitions

16.20.634 Mixing Zone

16.20.635 Sampling Methods

Rules 16.20.636 through 16.20.640 reserved

16.20.641 Radiological Criteria

16.20.642 Bioassay Median Tolerance Concentrations

16.20.643 Metal Limits

Sub-Chapters 7 and 8 reserved

Sub-Chapter 9

Montana Pollutant Discharge Elimination Syster (MPDES) Permit

Rule 16.20.901 Purpose

16.20.902 Definitions

Rule 16.20.903 reserved

NEXT PAGE IS 16-489

Sub-Chapter 6

Surface Water Quality Standards

16.20.601 POLICY The following standards are adopted to conserve water by protecting, maintaining, and improving the quality and potability of water for public water supplies, wildlife, fish and aquatic life, agriculture, industry, recreation, and other beneficial uses. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.602 APPLICATION AND COMPOSITION OF SURFACE WATER QUALITY STANDARDS (1) The standards in this sub-chapter are adopted to establish maximum allowable changes in surface water quality and to establish a basis for limiting the discharge of pollutants which affect prescribed beneficial uses of surface waters.

(2) The surface water quality standards are composed of all rules of this sub-chapter.

(3) The provisions of ARM 16.20.631 through 16.20.635 and 16.20.641 and 16.20.642 apply to all surface waters unless they conflict with ARM 16.20.615 through 16.20.624 in which case the requirements of ARM 16.20.615 through 16.20.624 prevail. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.603 DEFINITIONS In this sub-chapter the following terms shall have the meanings indicated below and shall be supplemental to the definitions given in section 75-5-103, MCA:

(1) "Conventional water treatment" means in order of application the processes of coagulation, sedimentation, filtration and chlorination. If determined necessary by the department it also includes taste and odor control and lime softening.

(2) "Conduit" means any artificial or natural duct, either open or closed, capable of conveying liquids or pollutants.

(3) "Dewatered stream" means a perennial or intermittent stream from which water has been removed for one or more beneficial uses.

(4) "EPA" means the U.S. Environmental Protection Agency.

(5) "Ephemeral stream" means a stream or part of a stream which flows only in direct response to precipitation in the immediate water-shed or in response to the melting of a cover of snow and ice and whose channel bottom is always above the local water table.

(6) "Geometric mean" means the value obtained by taking the Nth root of the product of the measured values where zero values for measured values are taken to be the detection limit.

(7) "Intermittent stream" means a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface runoff and ground water discharge.

(8) "Mixing zone" means the area of a water body contiguous to an effluent with characteristics qualitatively or quantitatively different from those of the receiving water. The mixing zone is a place where effluent and receiving water mix and not a place where effluents are treated. Water quality standards do not apply in the mixing zone for those parameters regulated by a MPDES or NPDES permit.

(9) "MPDES" means the Montana Pollutant Discharge Elimination System.

(10) "NPDES" means the National Pollutant Discharge Elimination System.

(11) "Naturally occurring" means conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil and water conservation practices have been applied. Conditions resulting from the reasonable operation of dams in existence as of July 1, 1971 are natural.

(12) "Nonpoint source" means the source of pollutants which originates from diffuse runoff, seepage, drainage, or infiltration.

(13) "Pesticide" means insecticides, herbicides, rodenticides, fungicides or any substance or mixture of substances intended for preventing, destroying, controlling, repelling, altering life processes, or mitigating any insects, rodents, nematodes, fungi, weeds and other forms of plant or animal life.

(14) "Pollutants" means sewage, industrial wastes and other wastes as defined in sections 75-5-103(1),(2),(3), MCA.

(15) "Sediment" means solid material settled from suspension in a liquid; mineral or organic solid material that is being transported or has been moved from its site of origin by air, water or ice and has come to rest on the earth's surface, either above or below sea level; or inorganic or organic particles originating from weathering, chemical precipitation or biological activity.

(16) "Settleable solids" means inorganic or organic particles that are being transported or have been transported by water from the site or sites of origin and are settled or are capable of being settled from suspension.

(17) "Sewer" means a pipe or conduit that carries wastewater or drainage water.

(18) "Surface waters" means any waters on the earth's surface, including but not limited to, streams, lakes, ponds, and reservoirs; and irrigation and drainage systems discharging directly into a stream, lake, pond, reservoir or other surface water. Water bodies used solely for treating, transporting or impounding pollutants shall not be considered surface water.

(19) "Storm sewer" or "storm drain" means a pipe or conduit that carries storm water and surface water and street washings.

(20) "True color" means the color of water from which the turbidity has been removed.

(21) "Turbidity" means a condition in water or wastewater caused by the presence of suspended matter resulting in the scattering and absorption of light rays. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.604 WATER-USE CLASSIFICATIONS -- CLARK FORK - COLUMBIA RIVER DRAINAGE EXCEPT THE FLATHEAD AND KOOTENAI RIVER DRAINAGES The water-use classifications adopted for the Clark Fork of the Columbia River drainage are as follows:

(1) Clark Fork River drainage except waters listed in subsections (1)(a) through (1)(n) B-1

(a) Warm Springs drainage to Myers Dam near Anaconda A-1

(b) Silver Bow Creek (mainstem) from the confluence of Blacktail Deer Creek to Warm Springs Creek . . . . . E

(The Anaconda Company tailings pond and Silver Bow Creek drainage from this pond to Blacktail Deer Creek and the tailings ponds at Warm Springs have no classification.)

(c) Yankee Doodle Creek drainage to and including the North Butte water supply reservoir . . . A-Closed

(d) Basin Creek drainage to and including the South Butte water supply reservoir . . . . . A-Closed

(e) Clark Fork River (mainstem) from Warm Springs Creek to Cottonwood Creek (near Deer Lodge) C-2

(f) Clark Fork River (mainstem) from Cottonwood Creek to the Little Blackfoot River C-1

(g) Tin Cup Joe Creek drainage to the Deer Lodge water supply intake . . . . . A-Closed

(h) Georgetown Lake and tributaries above Georgetown Dam (headwaters of Flint Creek drainage) A-1

(i) Fred Burr Lake and headwaters from source to the outlet of the lake (Philipsburg water supply) . . . . . A-Closed
(j) South Boulder Creek drainage to the Philipsburg water supply intake A-1
(k) Rattlesnake drainage to the Missoula water supply intake . . . . . A-Closed
(l) Packer and Silver Creek drainage (tributaries to the St. Regis River) to the Saltese water supply intake A-1
(m) Ashley Creek drainage to the Thompson Falls water supply intake . . . . . A-Closed
(n) Pilgrim Creek drainage to the Noxon water supply intake A-1
(History: Sec. 75-5-301 MCA: IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.605 WATER-USE CLASSIFICATIONS -- FLATHEAD RIVER DRAINAGE The water-use classifications adopted for the Flathead River are as follows:
(1) Flathead River drainage above Flathead Lake except waters listed in subsections (1)(a) through (1)(g) B-1
(a) Essex Creek drainage to the Essex water supply intake . . . . . A-Closed
(b) Stillwater River (mainstem) from Logan Creek to the Flathead River B-2
(c) Whitefish Lake and its tributaries A-1
(d) Whitefish River (mainstem) from the outlet of Whitefish Lake to the Stillwater River . . B-2
(e) Haskill Creek drainage to the Whitefish water supply intake A-1
(f) Ashley Creek (mainstem) from Smith Lake to bridge crossing on the airport road about one mile south of Kalispell B-2
(g) Ashley Creek (mainstem) from bridge crossing on airport road to the Flathead River . . . C-2
(2) Flathead Lake and its tributaries from Flathead River inlet to U.S. Highway 93 bridge at Polson except Swan River and portions of Hellroaring Creek as listed in subsections (2)(a) through (2)(c) but including Swan Lake proper and Lake Mary Ronan proper A-1
(a) Swan River drainage (except Swan Lake proper) B-1
(b) Hellroaring Creek drainage to the Polson water supply intake . . . . . A-Closed
(c) Remainder of Hellroaring Creek drainage . . B-1

(3) Flathead River drainage below the highway bridge at Polson to confluence with Clark Fork River except tributaries listed in subsections (3)(a) through (3)(h) B-1
(a) Second Creek drainage to the Ronan water supply intake . . . . . A-Closed
(b) Crow Creek (mainstem) from road crossing in Section 16, T20N, R20W to the Flathead River . . . B-1
(c) Little Bitterroot River (mainstem) from Hubbart Reservoir dam to the Flathead River B-2
(d) Hot Springs Creek drainage to the Hot Springs water supply intake . . . . . A-Closed
(e) Hot Springs Creek (mainstem) from the Hot Springs water supply intake to the Little Bitterroot River . . . . . E
(f) Tributaries to Hot Springs Creek (if any) from the Hot Springs water supply intake to the Little Bitterroot River B-1
(g) Mission Creek drainage to the St. Ignatius water supply intake A-1
(h) Mission Creek (mainstem) from U.S. Highway No. 93 crossing to the Flathead River B-2
(History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.606 WATER-USE CLASSIFICATIONS -- KOOTENAI RIVER DRAINAGE The water-use classifications adopted for the Kootenai River are as follows:
(1) All waters except those listed in subsections (1)(a) through (1)(d) B-1
(a) Deep Creek drainage (tributary to the Tobacco River) to the Fortine water supply intake . . A-1
(b) Rainy Creek drainage to the W. R. Grace Company water supply intake A-1
(c) Rainy Creek (mainstem) from the W. R. Grace Company water supply intake to the Kootenai River C-1
(d) Flower Creek drainage to the Libby water supply intake A-1
(History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.607 WATER-USE CLASSIFICATIONS -- MISSOURI RIVER DRAINAGE EXCEPT YELLOWSTONE, BELLE FOURCHE, AND LITTLE MISSOURI RIVER DRAINAGES The water-use classifications adopted for the Missouri River are as follows:

(1) Missouri River drainage to and including the Sun River drainage except tributaries listed in subsections (1)(a) through (1)(n) B-1
(a) East Gallatin River (mainstem) from Montana Highway No. 293 crossing about one-half mile north of Bozeman to Dry Creek about five miles east of Manhattan B-2
(b) Lyman and Sourdough (Bozeman) Creek drainages to the Bozeman water supply intakes . . . . A-Closed
(c) Remainder of the Lyman and Sourdough Creek drainages B-2
(d) Hyalite Creek drainage to the Bozeman water supply intake A-1
(e) Big Hole River drainage to Butte Water Company intake above Divide A-1
(f) Rattlesnake Creek drainage to the Dillon water supply intake A-1
(g) Indian Creek drainage to the Sheridan water supply intake A-1
(h) Basin Creek drainage to the Basin water supply intake A-1
(i) McClellan Creek drainage to the East Helena water supply intake A-1
(j) Prickly Pear Creek (mainstem) from the Montana Highway No. 433 crossing about one mile northwest of East Helena to Lake Helena . . . . . E
(k) Ten Mile Creek drainage to the Helena water supply intake A-1
(l) Willow Creek drainage to the White Sulphur Springs water supply intake . . . . . A-Closed
(m) Muddy Creek drainage (tributary to Sun River) . . . . . E
(n) Sun River (mainstem) from Muddy Creek to the Missouri River B-3
(2) Missouri River drainage from Sun River to Rainbow Dam B-2
(3) Missouri River drainage from Rainbow Dam in Great Falls to the Marias River except waters listed in subsections (3)(a) through (3)(d). . B-3
(a) Belt Creek drainage to and including Otter Creek drainage except portion of O'Brien Creek listed in subsection (3)(a)(i) E-1
(i) O'Brien Creek drainage to the Neihart water supply intake A-1
(b) Belt Creek (mainstem) from Otter Creek to the Missouri River B-2
(c) Tributaries to Belt Creek from Otter Creek to the Missouri River B-1
(d) Highwood and Shonkin Creek drainages . . . B-1

(4) Marias River drainage except the tributaries listed in subsections (4)(a) through (4)(d) . . . B-1
(a) Cutbank Creek drainage except waters listed in subsections (4)(a)(i) and (ii). B-1
(i) Willow Creek (mainstem) from the Montana Highway No. 464 crossing about one-half mile north of Browning to Cutbank Creek B-2
(ii) Cutbank Creek (mainstem) from Old Maid Miller Coulee near Cut Bank to Birch Creek . . . B-2
(b) Two Medicine Creek drainage except for the waters listed in subsections (4)(b)(i) through (4)(b)(iii) B-1
(i) Midvale Creek drainage to the East Glacier water supply intake . . . . . A-Closed
(ii) Summit Creek drainage to the Summit water supply intake . . . . . A-Closed
(iii) Two Medicine Creek (mainstem) from Badger Creek to Birch Creek B-2
(c) Dry Fork Marias River (mainstem) from Interstate 15 crossing near Conrad to Marias River B-3
(d) Teton River drainage to and including Deep Creek near Choteau B-1
(5) Missouri River drainage from Marias River to Fort Peck Dam except waters listed in subsections (5)(a) through (5)(e) C-3
(a) Missouri River (mainstem) from Marias River to Fort Peck Dam B-3
(b) Eagle Creek drainage to but excluding Dog Creek B-1
(c) Judith River drainage except waters listed in subsections (5)(c)(i) through (5)(c)(v) . . B-1
(i) Big Spring Creek (mainstem) from the Mill Ditch headgate to the Judith River B-2
(ii) Judith River (mainstem) from Big Spring Creek to the Missouri River B-2
(iii) Sage Creek drainage below U.S. Highway 87 . . . . . C-3
(iv) Wolf Creek drainage below U.S. Highway 87 . . . . . C-3
(v) Tributaries to Judith River from Big Spring Creek to the Missouri River C-3
(d) Cow Creek drainage to but excluding Al's Creek B-1
(e) Musselshell River drainage except for the waters listed in subsections (5)(e)(i) through (5)(e)(v) B-1
(i) Musselshell River (mainstem) to Deadman's Basin Diversion Canal near Shawmut B-2

(ii) Musselshell River drainage below Deadman's Basin diversion canal above Shawmut except portions of Careless, Swimming Woman, Flatwillow and South Willow Creek drainages listed below C-3
(iii) Careless and Swimming Woman Creek drainage above their confluence north of Ryegate . . B-1
(iv) Flatwillow Creek drainage above U.S. Highway 87 crossing south of Grassrange B-2
(v) South Willow Creek drainage above county road bridge in T10N, R24E, Section 7 . . . . . B-1
(6) Missouri River drainage from Fort Peck Dam to the Milk River B-2
(7) Milk River drainage from source (or from the Glacier National Park Boundary) to the International Boundary B-1
(8) Milk River drainage from the International Boundary to the Missouri River except the tributaries listed in subsections (8)(a) through (8)(c) B-3
(a) Big Sandy Creek drainage to Town of Big Sandy infiltration wells B-1
(b) Beaver, Little Box Elder and Clear Creek drainage (near Havre) B-1
(c) People's Creek drainage to and including the South Fork of People's Creek drainage . . B-1
(9) Missouri River drainage from Milk River to North Dakota boundary except waters listed in subsections (9)(a) through (9)(d) C-3
(a) Missouri River (mainstem) from Milk River to North Dakota boundary B-3
(b) Wolf Creek drainage near Wolf Point B-2
(c) Antelope Creek drainage near Antelope . . . B-3
(d) Poplar River drainage B-2

(History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.608 WATER-USE CLASSIFICATION -- YELLOWSTONE RIVER DRAINAGE The water-use classifications adopted for the Yellowstone River are as follows:
(1) Yellowstone River drainage to the Laurel water supply intake B-1
(2) Yellowstone River drainage from the Laurel water supply intake to the Billings water supply intake except the tributaries listed in subsections (2)(a) and (2)(b) B-2
(a) Clarks Fork Yellowstone River drainage from source to the Wyoming state line and from

the Wyoming state line to and including Jack Creek near Bridger B-1
(b) Tributaries to the Clarks Fork Yellowstone River from Jack Creek (mainstem is B-2) to the Yellowstone River except the portion of West Fork of Rock Creek listed in subsection (2)(b)(a) B-1
(a) West Fork of Rock Creek drainage to the Red Lodge water supply intake A-1
(3) Yellowstone River drainage from the Billings water supply intake to the North Dakota state line and including the Big Horn River drainage except the waters listed in subsections (3)(a) through (3)(f) C-3
(a) Yellowstone River mainstem B-3
(b) Pryor Creek drainage to Interstate 90 . . . B-1
(c) Big Horn drainage above but excluding Williams Coulee near Hardin B-1
(d) Little Big Horn drainage above and including Lodgegrass Creek drainage near Lodge Grass B-1
(e) Remainder of the Little Big Horn drainage B-2
(f) Big Horn River mainstem from Williams Coulee to Yellowstone River B-2
(4) Yellowstone River drainage from Big Horn River to North Dakota boundary except waters listed in subsections (4)(a) through (4)(d). . C-3
(a) Yellowstone River mainstem from Big Horn River to North Dakota boundary B-3
(b) Tongue River (mainstem) from Wyoming boundary to Prairie Dog Coulee B-2
(c) Tongue River mainstem from Prairie Dog Coulee to Yellowstone River B-3
(d) Fox Creek drainage near Sidney B-2
(History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.609 WATER-USE CLASSIFICATIONS -- LITTLE MISSOURI RIVER DRAINAGE -- BELLE FOURCHE DRAINAGE The water-use classifications adopted for all waters in the Little Missouri and Belle Fourche drainages are C-3
(History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/1/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.610 WATER-USE CLASSIFICATIONS -- HUDSON BAY DRAINAGE The water-use classifications for the Hudson Bay drainage are:

(1) All waters outside Glacier National Park B-1

(History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.611 WATER-USE CLASSIFICATIONS -- NATIONAL PARK, WILDERNESS AND PRIMITIVE AREA WATERS The water-use classifications for all national park, wilderness and primitive area waters are as follows:

(1) All waters even if classifications listed in ARM 16.20.604 through ARM 16.20.610 imply or state otherwise A-1

(History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

Rules 16.20.612 through 16.20.614 reserved

16.20.615 SPECIFIC SURFACE WATER QUALITY STANDARDS -- GENERAL (1) Specific surface water quality standards, along with general provisions in ARM 16.20.631 through 16.20.637 and ARM 16.20.641 and 16.20.642, protect the beneficial water uses set forth in the water-use descriptions for the following classifications of water.

(2) Standards for organisms of the coliform group are based on a minimum of five samples obtained during separate 24-hour periods during any consecutive 30-day period analyzed by the most probable number or equivalent membrane filter methods. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.616 A-CLOSED CLASSIFICATION (1) Waters classified A-Closed are suitable for drinking, culinary and food processing purposes after simple disinfection.

(2) Public access and activities such as livestock grazing and timber harvest are to be controlled by the utility owner under conditions prescribed and orders issued by the department.

(3) For waters classified A-Closed the following specific water quality standards shall not be violated by any person:

(a) The geometric mean number of organisms in the coliform group must not exceed 50 per 100 milliliters.

(b) Dissolved oxygen criteria are not applicable for the classification.

(c) No change from natural pH is allowed.

(d) No increase above naturally occurring turbidity is allowed.

(e) No increase above naturally occurring water temperature is allowed.

(f) No increases are allowed above naturally occurring concentrations of sediment, settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(g) No increase in true color is allowed.

(h) No increases of toxic or other deleterious substances, pesticides and organic and inorganic materials including heavy metals, above naturally occurring concentrations, are allowed.

(i) No increase in radioactivity above natural background levels is allowed. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.617 A-1 CLASSIFICATION (1) Waters classified A-1 are suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities.

(2) Water quality must be suitable for bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

(3) For waters classified A-1 the following specific water quality standards shall not be violated by any person:

(a) The geometric mean number of organisms in the coliform group must not exceed 50 per 100 milliliters if resulting from domestic sewage.

(b) Dissolved oxygen concentration must not be reduced below 7.0 milligrams per liter.

(c) Induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 8.5 must be less than 0.5 pH unit. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0.

(d) No increase above naturally occurring turbidity is allowed except as permitted in ARM 16.20.631 through 16.20.635 and ARM 16.20.641 and 16.20.642.

(e) A 1° F maximum increase above naturally occurring water temperature is allowed within the range of 32° F to 66° F; within the naturally occurring range of 66° F to 66.5° F, no discharge is allowed which will cause the water temperature to exceed 67° F; and where the naturally occurring water temperature is 66.5° F or greater, the maximum allowable increase in water temperature is 0.5° F. A 2° F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55° F, and a 2° F maximum decrease below naturally occurring water temperature is allowed within the range of 55° F to 32° F.

(f) No increases are allowed above naturally occurring concentrations of sediment, settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(g) True color must not be increased more than two units above naturally occurring color.

(h) Concentrations of toxic or other deleterious substances which would remain in the water after conventional water treatment must not exceed the maximum contaminant levels set forth in the 1975 National Interim Primary Drinking Water Standards, (40 CFR Part 141) or subsequent revisions or the 1979 National Secondary Drinking Water Standards (40 CFR Part 143) or subsequent revisions. The maximum allowable concentrations of toxic or deleterious substances also must not

exceed acute or chronic problem levels as revealed by bioassay or other methods. The values listed in Quality Criteria for Water published by the Office of Water and Hazardous Materials, EPA, Washington, D.C. (The Red Book) shall be used as a guide to determine problem levels unless local conditions make these values inappropriate. In accordance with section 75-5-306(1), MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/74; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.618 B-1 CLASSIFICATION (1) Waters classified B-1 are suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

(2) For waters classified B-1 the following specific water quality standards shall not be violated by any person:

(a) The geometric mean number of organisms in the fecal coliform group must not exceed 200 per 100 milliliters, nor are 10 percent of the total samples during any 30-day period to exceed 400 fecal coliforms per 100 milliliters.

(b) Dissolved oxygen concentration must not be reduced below 7.0 milligrams per liter.

(c) Induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 8.5 must be less than 0.5 pH unit. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0.

(d) The maximum allowable increase above naturally occurring turbidity is 5 nephelometric turbidity units except as permitted in ARM 16.20.631 through 16.20.635 and ARM 16.20.641 and 16.20.642.

(e) A 1° F maximum increase above naturally occurring water temperature is allowed within the range of 32° F to 66° F; within the naturally occurring range of 66° F to 66.5° F, no discharge is allowed which will cause the water temperature to exceed 67° F; and where the naturally occurring water temperature is 66.5° F or greater, the maximum allowable increase in water temperature is 0.5° F. A 2° F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55° F, and a 2° F maximum decrease below naturally occurring water temperature is allowed within the range of 55° F to 32° F. This applies to all waters in the state classified B-1 except for Prickly Pear Creek from McClellan Creek to the Montana Highway No. 433 crossing where a 2° F maximum increase above naturally occurring water temperature is allowed within the

range of 32° F to 65° F; within the naturally occurring range of 65° F to 66.5° F, no discharge is allowed which will cause the water temperature to exceed 67° F; and where the naturally occurring water temperature is 66.5° F or greater, the maximum allowable increase in water temperature is 0.5° F.

(f) No increases are allowed above naturally occurring concentrations of sediment, settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(g) True color must not be increased more than five units above naturally occurring color.

(h) Concentrations of toxic or other deleterious substances which would remain in the water after conventional water treatment must not exceed the maximum contaminant levels set forth in the 1975 National Interim Primary Drinking Water Standards (40 CFR Part 141) or subsequent revisions or the 1979 National Secondary Drinking Water Standards (40 CFR Part 143) or subsequent revisions. The maximum allowable concentrations of toxic or deleterious substances also must not exceed acute or chronic problem levels as revealed by bio-assay or other methods. The values listed in Quality Criteria for Water published by the Office of Water and Hazardous Materials, EPA, Washington, D.C. (The Red Book) shall be used as a guide to determine problem levels unless local conditions make these values inappropriate. In accordance with section 75-5-306(1), MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.619 B-2 CLASSIFICATION (1) Waters classified B-2 are suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

(2) For waters classified B-2 the following specific water quality standards shall not be violated by any person

(a) The geometric mean number of organisms in the fecal coliform group must not exceed 200 per 100 milliliters, nor are 10 percent of the total samples during any 30-day period to exceed 400 fecal coliforms per 100 milliliters.

(b) Dissolved oxygen concentration must not be reduced below 7.0 milligrams per liter from October 1 through June 1 nor below 6.0 milligrams per liter from June 2 through September 30.

(c) Induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 9.0 must be less than [illegible] pH unit. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above [illegible]

(d) The maximum allowable increase above naturally occurring turbidity is 10 nephelometric turbidity units except as permitted in ARM 16.20.631 through 16.20.635 and ARM 16.20.641 and 16.20.642.

(e) A 1° F maximum increase above naturally occurring water temperature is allowed within the range of 32° F to 66° F; within the naturally occurring range of 66° F to 66.5° F, no discharge is allowed which will cause the water temperature to exceed 67° F; and where the naturally occurring water temperature is 66.5° F or greater, the maximum allowable increase in water temperature is 0.5° F. A 2° F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55° F, and a 2° F maximum decrease below naturally occurring water temperature is allowed within the range of 55° F to 32° F.

(f) No increases are allowed above naturally occurring concentrations of sediment, settleable solids, oils, or floating solids which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(g) True color must not be increased more than [illegible] units above naturally occurring color.

(h) Concentrations of toxic or other deleterious substances which would remain in the water after conventional water treatment must not exceed the maximum contaminant levels set forth in the 1975 National Interim Primary Drinking Water Standards (40 CFR Part 141) or subsequent revisions or the 1979 National Secondary Drinking Water Standards (40 CFR Part 143) or subsequent revisions. The maximum allowable concentrations of toxic or deleterious substances also must not exceed acute or chronic problem levels as revealed by bio-assay or other methods. The values listed in Quality Criteria for Water published by the Office of Water and Hazardous Materials, EPA, Washington, D.C. (The Red Book) shall be used as a guide to determine problem levels unless local conditions make these values inappropriate. In accordance with section 75-5-306(1), MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2262, Eff. 8/1/80.)

16.20.620 B-3 CLASSIFICATION (1) Waters classified B-3 are suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

(2) For waters classified B-3 the following specific water quality standards shall not be violated by any person:

(a) The geometric mean number of organisms in the fecal coliform group must not exceed 200 per 100 milliliters, nor are 10 percent of the total samples during any 30-day period to exceed 400 fecal coliforms per 100 milliliters.

(b) Dissolved oxygen concentration must not be reduced below 5.0 milligrams per liter.

(c) Induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 9.0 must be less than 0.5 pH unit. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0.

(d) The maximum allowable increase above naturally occurring turbidity is 10 nephelometric turbidity units except as permitted in ARM 16.20.631 through 16.20.635 and ARM 16.20.641 and 16.20.642.

(e) A 3° F maximum increase above naturally occurring water temperature is allowed within the range of 32° F to 77° F; within the naturally occurring range of 77° F to 79.5° F, no thermal discharge is allowed which will cause the water temperature to exceed 80° F; and where the naturally occurring water temperature is 79.5° F or greater, the maximum allowable increase in water temperature is 0.5° F. A 2° F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55° F, and a 2° F maximum decrease below naturally occurring water temperature is allowed within the range of 55° F to 32° F.

(i) These allowable increases apply to all waters in the state classified B-3, except for the mainstem of the Yellowstone River from the Billings water supply intake to the water diversion at Intake, where a 3° F maximum increase above naturally occurring water temperature is allowed within the range of 32° F to 79° F; within the range of 79° F to 81.5° F, no thermal discharge is allowed which will cause the water temperature to exceed 82° F; and where the naturally occurring water temperature is 81.5° F or greater, the maximum allowable increase in water temperature is 0.5° F.

(ii) From the water diversion at Intake to the North Dakota state line, a 3° F maximum increase above naturally occurring water temperature is allowed within the range of 32° F to 82° F; within the range of 82° F to 84.5° F, no thermal discharge is allowed which will cause the water temperature to exceed 85° F; and where the naturally occurring

water temperature is 84.5° F or greater, the maximum allowable increase in water temperature is 0.5° F.

(f) No increases are allowed above naturally occurring concentrations of sediment, settleable solids, oils, or floating solids which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(g) True color must not be increased more than five units above naturally occurring color.

(h) Concentrations of toxic or other deleterious substances which would remain in the water after conventional water treatment must not exceed the maximum contaminant levels set forth in the 1975 National Interim Primary Drinking Water Standards (40 CFR Part 141) or subsequent revisions or the 1979 National Drinking Water Standards (40 CFR Part 143) or subsequent revisions. The maximum allowable concentrations of toxic or deleterious substances also must not exceed acute or chronic problem levels as revealed by bio-assay or other methods. The values listed in Quality Criteria for Water published by the Office of Water and Hazardous Materials, EPA, Washington, D.C. (The Red Book) shall be used as a guide to determine problem levels unless local conditions make these values inappropriate. In accordance with section 75-5-306(1) MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.621 C-1 CLASSIFICATION (1) Waters classified C-1 are suitable for bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

(2) For waters classified C-1 the following specific water quality standards shall not be violated by any person:

(a) The geometric mean number of organisms in the fecal coliform group must not exceed 200 per 100 milliliters, nor are 10 percent of the total samples during any 30-day period to exceed 400 fecal coliforms per 100 milliliters.

(b) Dissolved oxygen concentration must not be reduced below 7.0 milligrams per liter.

(c) Induced variation of hydrogen ion concentration within the range of 6.5 to 8.5 must be less than 0.5 pH unit. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0.

(d) The maximum allowable increase above naturally occurring turbidity is 5 nephelometric turbidity units.

except as permitted in ARM 16.20.631 through 16.20.635 and ARM 16.20.641 and 16.20.642.

(e) A 1° F maximum increase above naturally occurring water temperature is allowed within the range of 32° F to 66° F; within the naturally occurring range of 66° F to 66.5° F, no discharge is allowed which will cause the water temperature to exceed 67° F; and where the naturally occurring water temperature is 66.5° F or greater, the maximum allowable increase in water temperature is 0.5° F. A 2° F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55° F, and a 2° F maximum decrease below naturally occurring water temperature is allowed within the range of 55° F to 32° F.

(f) No increases are allowed above naturally occurring concentrations of sediment, settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(g) True color must not be increased more than five units above naturally occurring color.

(h) Concentrations of toxic or deleterious substances must not exceed levels which render the waters harmful, detrimental or injurious to public health. The maximum allowable concentrations of toxic or deleterious substances also must not exceed acute or chronic problem levels as revealed by bioassay or other methods. The values listed in Quality Criteria for Water published by the Office of Water and Hazardous Materials, EPA, Washington, D.C. (The Red Book) shall be used as a guide to determine problem levels unless local conditions make these values inappropriate. In accordance with section 75-5-306(1), MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water.

(i) In the segment of the Clark Fork River classified C-1, the parameter limits set forth below apply rather than the limits listed for these parameters in the Red Book:

Parameter	Maximum Instantaneous Concentration ug/l
Total copper	9[illegible]
Total zinc	30[illegible]
Total iron	130[illegible]
Total lead	1[illegible]
Total [illegible]	1[illegible]
Total [illegible]	5[illegible]
Total mercury	1

(History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.622 C-2 CLASSIFICATION (1) Waters classified C-2 are suitable for bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

(2) For waters classified C-2 the following specific water quality standards shall not be violated by any person:

(a) The geometric mean number of organisms in the fecal coliform group must not exceed 200 per 100 milliliters, nor are 10 percent of the total samples during any 30-day period to exceed 400 fecal coliforms per 100 milliliters.

(b) Dissolved oxygen concentration must not be reduced below 7.0 milligrams per liter from October 1 through June 1 nor below 6.0 milligrams per liter from June 2 through September 30.

(c) Induced variation of hydrogen ion concentration within the range of 6.5 to 9.0 must be less than 0.5 pH unit. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0.

(d) The maximum allowable increase above naturally occurring turbidity is 10 nephelometric turbidity units except as permitted in ARM 16.20.631 through 16.20.635 and ARM 16.20.641 and 16.20.642.

(e) A 1° F maximum increase above naturally occurring water temperature is allowed within the range of 32° F to 66° F; within the naturally occurring range of 66° F to 66.5° F, no discharge is allowed which will cause the water temperature to exceed 67° F; and where the naturally occurring water temperature is 66.5° F or greater, the maximum allowable increase in water temperature is 0.5° F. A 2° F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55° F, and a 2° F maximum decrease below naturally occurring water temperature is allowed within the range of 55° F to 32° F.

(f) No increases are allowed above naturally occurring concentrations of sediment, settleable solids, oils, or floating solids which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(g) True color must not be increased more than five units above naturally occurring color.

(h) Concentrations of toxic or deleterious substances must not exceed levels which render the waters harmful, detrimental or injurious to public health. The maximum allowable concentrations of toxic or deleterious substances also must not exceed acute or chronic problem levels as revealed by bio-assay or other methods. The values listed in Quality Criteria for Water published by the Office of Water and Hazardous Materials, EPA, Washington, D.C. (The Red Book)

shall be used as a guide to determine problem levels unless local conditions make these values inappropriate. In accordance with section 75-5-306(1), MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water.

(i) In the segment of the Clark Fork River classified C-2, the parameter limits set forth below apply rather than the limits listed for these parameters in the Red Book:

Parameter	Maximum Instantaneous Concentration ug/l
Total copper	90
Total zinc	300
Total iron	2200
Total lead	100
Total cadmium	10
Total arsenic	50
Total mercury	1

(History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.623 E CLASSIFICATION (1) Waters classified E are suitable for agricultural and industrial water uses other than food processing.

(2) For waters classified E the following specific water quality standards shall not be violated by any person:

(a) The geometric mean number of organisms in the fecal coliform group must not exceed 200 per 100 milliliters, nor are 10 percent of the total samples during any 30-day period to exceed 400 fecal coliforms per 100 milliliters.

(b) Dissolved oxygen concentration must not be reduced below 3.0 milligrams per liter.

(c) Hydrogen ion concentration must be maintained within the range of 6.5 to 9.5.

(d) No increase in naturally occurring turbidity is allowed which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(e) No increase in naturally occurring temperature is allowed which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(f) No increases above naturally occurring concentrations of sediment and settleable solids, oils, or floating solids are allowed which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public

health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(g) No increase above naturally occurring true color is allowed which will or is likely to create a nuisance or render the water harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(h) Concentrations of toxic or deleterious substances, pathogens, pesticides and organic and inorganic materials including heavy metals must be less than those demonstrated to be deleterious to livestock or plants or to humans who may consume such livestock or plants or to adversely affect other indicated uses. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.624 C-3 CLASSIFICATION (1) The quality of these waters is naturally marginal for drinking, culinary and food processing purposes, agriculture and industrial water supply; however, since no better quality of water is available for these uses, degradation which will impact established beneficial uses will not be allowed.

(2) For waters classified C-3 the following specific water quality standards shall not be violated by any person:

(a) The geometric mean number of organisms in the fecal coliform group must not exceed 200 per 100 milliliters, nor are 10 percent of the total samples during any 30-day period to exceed 400 fecal coliforms per 100 milliliters.

(b) Dissolved oxygen concentration must not be reduced below 5.0 milligrams per liter.

(c) Induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 9.0 must be less than 0.5 pH unit. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0.

(d) The maximum allowable increase above naturally occurring turbidity is 10 nephelometric turbidity units, except as permitted in ARM 16.20.631 through 16.20.635 and ARM 16.20.641 and 16.20.642.

(e) A 3° F maximum increase above naturally occurring water temperature is allowed within the range of 32° F to 77° F; within the range of 77° F to 79.5° F, no thermal discharge is allowed which will cause the water temperature to exceed 80° F; and where the naturally occurring water temperature is 79.5° F or greater, the maximum allowable increase in water temperature is 0.5° F. A 2° F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55° F, and a 2° F maximum decrease below naturally occurring water temperature is allowed within the range of 55° F to 32° F.

(f) No increases are allowed above naturally occurring concentrations of sediment, settleable solids, oils or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.

(g) True color must not be increased more than five units above naturally occurring color.

(h) Concentrations of toxic or other deleterious substances must not exceed levels which render the waters harmful, detrimental or injurious to public health. The maximum allowable concentrations of toxic or deleterious substances also must not exceed acute or chronic problem levels as revealed by bio-assay or other methods. The values listed in Quality Criteria for Water published by the Office of Water and Hazardous Materials, EPA, Washington, D.C. (The Red Book) shall be used as a guide to determine problem levels unless local conditions make these values inappropriate. In accordance with section 75-5-306(1), MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

Rules 16.20.625 through 16.20.630 reserved

16.20.631 TREATMENT STANDARDS (1) The degree of waste treatment required to restore and maintain the quality of surface waters to the standards shall be based on the surface water quality standards and the following:

(a) The state's policy of nondegradation of existing high water quality as described in section 75-5-303, MCA;

(b) Present and anticipated beneficial uses of the receiving water;

(c) The quality and nature of the flow of the receiving water;

(d) The quantity and quality of the sewage, industrial waste or other waste to be treated; and

(e) The presence or absence of other sources of pollution in the same watershed.

(2) Sewage must receive a minimum of secondary treatment as defined by EPA in accordance with requirements set forth in the Federal Water Pollution Control Act, 33 U.S.C. et seq. (Supp. 1973), as amended, and 40 CFR Part 133 and subsequent amendments. Copies of 40 CFR Part 133 and subsequent amendments may be obtained from the department.

(3) Industrial waste must receive, as a minimum, treatment equivalent to the best practicable control technology currently available (BPCTCA) as defined in 40 CFR Subchapter N and subsequent amendments. Copies of 40 CFR Subchapter N and subsequent amendments may be obtained from the department. In cases where BPCTCA is not defined by EPA, industrial waste must receive a minimum of secondary treatment or equivalent as determined by the department.

(4) For design of disposal systems, stream flow dilution requirements must be based on the minimum consecutive 7-day average flow which may be expected to occur on the average of once in 10 years. When dilution flows are less than the above design flow at a point discharge, the discharge is to be governed by the permit conditions developed for the discharge through the waste discharge permit program. If the flow records on an affected surface water are insufficient to calculate a 10-year 7-day low flow, the department shall determine an acceptable stream flow for disposal system design. The department shall determine the acceptable stream flow for disposal system design for controlling nitrogen and phosphorus concentrations. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/14/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.632 OPERATION STANDARDS Owners and operators of water impoundments operating prior to July 1971 that cause conditions harmful to prescribed beneficial uses of state water shall demonstrate to the satisfaction of the department that continued operations will be done in the best practicable

manner to minimize harmful effects. New water impoundments must be designed to provide temperature variations in discharging water that maintain or enhance the existing propagating fishery and associated aquatic life. As a guide, the following temperature variations are recommended: Continuously less than 40° F during the months of January and February, and continuously greater than 44° F during the months of June through September. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.633 PROHIBITIONS (1) State surface waters must be free from substances attributable to municipal, industrial, agricultural practices or other discharges that will:

(a) Settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;

(b) Create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;

(c) Produce odors, colors or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;

(d) Create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; and

(e) Create conditions which produce undesirable aquatic life.

(2) No wastes may be discharged and no activities conducted such that the wastes or activities, either alone or in combination with other wastes or activities, will violate, or can reasonably be expected to violate, any of the standards.

(3) No wastes are to be discharged and no activities conducted which, either alone or in combination with other wastes or activities, will cause violations of surface water quality standards; provided, a short term exemption from a surface water quality standard may be authorized by the department under the following conditions:

(a) If the Department of Fish, Wildlife and Parks reviews a short-term construction or hydraulic project under section 87-5-501 et seq., MCA, or section 75-7-101 et seq., MCA, an increase in turbidity caused by the project will be exempt from the applicable turbidity standard unless the department is advised by the Department of Fish, Wildlife and Parks that the project may result in a significant increase in turbidity. If the department is advised that the project may cause a significant increase in turbidity, the

[illegible] exempt [illegible] [illegible] is [illegible] [illegible] [illegible] [illegible] the department in a [illegible] authorization.

(a) A 16.20.633(3) application form must be submitted to the department by the applicant and a 16.20.633(3) authorization issued by the department prior to the day [illegible] the applicant commences the short-term construction or hydraulic project.

(b) If the department approves the location, [illegible] methods of game fish population restoration authorized by the Department of Fish, Wildlife and Parks, restoration [illegible] causing violations of surface water quality standards [illegible] exempt from the standards.

(c) If a short-term activity other than those specified in (a) and (b) above causes unavoidable short-term violations of the turbidity, total dissolved solids, or temperature standards, the activity is exempt from the standard if it is carried out in accordance with conditions prescribed by the department in a 16.20.633(3) authorization form.

(i) A 16.20.633(3) application form must be submitted to the department by the applicant and a 16.20.633(3) authorization issued by the department prior to the day on which the applicant commences the short-term activity.

(4) Leaching pads, tailing ponds or holding facilities utilized in the processing of ore must be located, constructed, operated and maintained in such a manner and of such materials so as to prevent the discharge, seepage, drainage, infiltration, or flow which may result in the pollution of surface waters. The department may require that a monitoring system be installed and operated if the department determines that pollutants are likely to reach surface waters or present a substantial risk to public health.

(a) Complete plans and specifications for proposed leaching pads, tailing ponds or holding facilities utilized in the processing of ore must be submitted to the department no less than 180 days prior to the day on which it is desired to commence their operation.

(b) Leaching pads, tailing ponds or holding facilities operating as of the effective date of this rule utilized in the processing of ore must be operated and maintained in such a manner so as to prevent the discharge, seepage, drainage, infiltration or flow which may result in the pollution of surface waters.

(5) Dumping of snow from municipal and/or parking [illegible] snow removal activities directly into surface waters or placing snow in a location where it is likely to cause pollution of surface waters is prohibited unless authorized in writing by the department.

(6) Until such time as minimum stream flows are established for dewatered streams, the minimum treatment requirements for discharges to dewatered receiving streams must be no less than the minimum treatment requirements set forth in ARM 16.20.631(2) and (3).

(7) Treatment requirements for discharges to ephemeral streams must be no less than the minimum treatment requirements set forth in ARM 16.20.631(2) and (3). Ephemeral streams are subject to ARM 16.20.631 through 16.20.635 and ARM 16.20.641 and 16.20.642 but not to the specific water quality standards of ARM 16.20.615 through 16.20.624.

(8) Pollution resulting from storm drainage, storm sewer discharges, and non-point sources, including irrigation practices, road building, construction, logging practices, overgrazing and other practices must be eliminated or minimized as ordered by the department.

(9) Application of pesticides in or adjacent to state surface waters must be in compliance with the labeled direction, and in accordance with provisions of the Montana Pesticides Act (Title 80, Chapter 8, MCA) and the Federal Environmental Pesticides Control Act (7 U.S.C. 136 et seq. (Supp. 1973) as amended). Excess pesticides and pesticide containers must not be disposed of in a manner or in a location where they are likely to pollute surface waters.

(10) No pollutants may be discharged and no activities may be conducted which, either alone or in combination with other wastes or activities, result in the total dissolved gas pressure relative to the water surface exceeding 110 percent of saturation.

(11) On all public water supply watersheds, detailed plans and specifications for the construction and operation of logging roads will be submitted to the department for its approval as required by Title 75, Chapter 6, MCA. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/14/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.634 MIXING ZONE Discharges to surface waters may be allowed a mixing zone which will have a minimum impact on surface water quality, as determined by the department. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/14/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.635 SAMPLING METHODS Methods of sample collection, preservation and analysis used to determine compliance with the standards must be in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater published by the American Public Health Association or in accordance with tests or procedures that have been found to be equally or more applicable by EPA as set forth in 40 CFR 136 and subsequent amendments. Copies of 40 CFR 136 and subsequent amendments may be obtained at the department. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

Rules 16.20.636 through 16.20.640 reserved

16.20.641 RADIOLOGICAL CRITERIA (1) No person shall cause radioactive materials in surface waters to:

(a) Be present in any amount which reflects failure in any case to apply all controls which are physically feasible;

(b) Exceed a concentration of 5 pCi/L of total Radium 226 plus Radium 228;

(c) Exceed a concentration of 8 pCi/L of total Strontium 90;

(d) Be present in the water or in sediments in amounts which could cause harmful accumulations of radioactivity in plants, wildlife, stock or aquatic life;

(e) Exceed the radiological limits established in the National Interim Drinking Water Standards (40 CFR Part 141) and subsequent amendments. Copies of the National Interim Drinking Water Standards and subsequent amendments may be obtained from the department. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.642 BIOASSAY MEDIAN TOLERANCE CONCENTRATIONS Bioassay tolerance concentrations must be determined using the latest available research results for the materials, by bioassay tests procedures for simulating actual stream conditions as set forth in the latest edition of Standard Methods for the Examination of Water and Wastewater published by the American Public Health Association, ASTM Standards Part 31, or in accordance with tests or analytical procedures that are found to be equal or more applicable by EPA. Any bioassay studies made must be made using a representative sensitive local species and life stages of economic or ecological importance; provided other species whose relative sensitivity is known may be used when there is difficulty in providing the more sensitive species in sufficient numbers or when such species are unsatisfactory for routine

confined bioassays. All bioassay methods and species selections must be approved by the department. (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, 1980 MAR p. 2252, Eff. 8/1/80.)

16.20.643 METAL LIMITS IS REPEALED (History: Sec. 75-5-301 MCA; IMP, Sec. 75-5-301 MCA; Eff. 12/31/72; AMD, Eff. 11/4/73; AMD, Eff. 9/5/74; AMD, [REP], 1980 MAR p. 2252, Eff. 8/1/80.)

NEXT PAGE IS 16-983

IN REPLY REFER TO

United States Department of the Interior
BUREAU OF LAND MANAGEMENT
222 North 32nd Street
P.O. Box 30157
Billings, Montana 59107

3463.1 (1117)
(Tongue River)

Memorandum

To: Regional Director, Office of Surface Mining, Brook Towers, 1020 15th Street, Denver, Colorado 80202

From: State Director

Subject: BLM's Final Recommendation Regarding the Coal Unsuitability Petition Filed by Northern Plains Resource Council et al.

1 After having reviewed the draft Tongue River Petition Evaluation Document and the comments made at the hearings in Ashland, Montana, October 22 and 23, I have decided to let stand my recommendation to you of March 20, 1981.

1 Your comment is noted.

BURLINGTON NORTHERN

Ms. Sandi Johnson
Montana Department of State Lands
Capitol Station
Helena, MT 59620

October 14, 1981

RE: Comments Tongue River, Montana Petition Evaluation Document (draft) 82-4-228 SUMRA and 522 SMCRA Evaluation DSL/OSM-PE-2

Dear Ms. Johnson:

On December 29, 1980, Northern Plains Resources Council filed the Tongue River petition with both the Montana Department of State Lands and the United States Office of Surface Mining Reclamation and Enforcement, seeking to have an area, located in southeastern Montana and in excess of 300 square miles, determined to be unsuitable for mining.

Pursuant to statutes and regulations governing action on the petition, Burlington Northern intervened, as of right, on April 8, 1981. At the time of intervention Burlington Northern requested preliminary determinations regarding due process rights of Burlington Northern as they would be effected by the regulatory framework established to process the petition. Additionally, Burlington Northern raised issues regarding the misapplication of the unsuitability designation process, lack of evidence to support the allegations made in the initial petition, frivolousness of the petition, and limitation of the petition process to those areas for which empirical evidence was submitted. These requests were denied orally by the Office of Surface Mining and later by letter on July 13, 1981 and orally by the Montana Department of State Lands and later by letter dated August 18, 1981. Upon administrative appeal to the Secretary of Interior regarding denial by the Office of Surface Mining of these requests, relief was denied. No such administrative appeal was available from the decision of the Department of State Lands.

While Burlington Northern was pursuing its administrative remedies, action was brought in Federal district court in Billings, Montana, challenging the statute by other parties. This action has been stayed, pending settlement negotiations between the parties. Burlington Northern did not intervene in the action.

As an intervenor in the petition proceeding, Burlington Northern bears an obligation to participate and has the right to judicial review of any final decision.

Subsequent to denial of relief at the administrative level, Burlington Northern submitted, on July 16, 1981, a technical analysis of the allegations raised on the petition. This document entitled "Tongue River Petition AreaLiterature Review" was prepared on Burlington Northern's behalf by Beak Consultants and was filed in Helena, Montana with the Department of State Lands, and in Denver with the Office of Surface Mining, Reclamation and Enforcement, United States Department of Interior.

The technical report submitted by Burlington Northern contained sections which discussed, among other things, surface mining in the Northern Great Plains and an overview of reclamation. These sections were followed by sections in the report which dealt with soils, surface preparation, revegetation, technological feasibility, reclamation, and hydrology (both surface and ground water).

* * *

As mentioned previously, Burlington Northern intervened in the petition proceedings on April 8, 1981. On September 16, 1981, notice was published in the Federal Register announcing the availability of the document, and inviting public comment.

In response to the Federal Register notice, Burlington Northern supplements its earlier comments as follows:

1

Comment 1:

a) It affirms in general the analyses and conclusions set out in the draft document, except as noted herein.

b) It urges OSM and DSL to set out conclusions in the hydrology section, based on hydrological data supplied by Burlington Northern or otherwise available, that surface mining in the petition area is not technically incompatible with preservation of renewable resource lands and waters; and

c) It urges OSM and DSL to clarify and supplement the draft document in the particulars noted herein, described in Exhibit "A" and set out in Exhibit "B."

1. Chapter I. Introduction

2

Comment 2:

This chapter is helpful in setting the stage for the remainder of the document. In establishing the scope of evaluation tasks, and by making reference to the legislative history of the statute authorizing the activities undertaken, the report establishes the matters to be later analyzed. While Burlington Northern reserves judgement on the legal analysis suggested within this section, it applauds this effort at clarification.

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1 Your comment is noted.

2 Your comment is noted.

The subsection dealing with event chronology, petition issues, summary of interventions, proposed Federal and State actions, and controlling legislation further clarifies activities and rationale for such activities related to processing of the draft document.

2. Chapter II. Description of the Petition Area

This chapter introduces to the location, topography, geology, hydrology, climate, air quality, vegetation, wildlife, land use, recreation, transportation, and cultural resources aspects of the petition area. In addition, social, economic, and community services background relating to the petition area are stated.

3 Comment 3:

This information is helpful in establishing the background environment of the petition area.

3 Your comment is noted.

4 Comment 4:

It must be noted that this information is introductory only, and can have no bearing upon the final decision. As stated in its letter to Burlington Northern denying its requests for preliminary determinations in this matter, referred to above, the Office of Surface Mining has interpreted its legislative mandate as limiting its inquiry in these proceedings to only those matters raised in the petition; specifically, soils, hydrology and the technological feasibility of reclamation. To change position on this interpretation and utilize any information in this description of the petition area section as the basis of any decision, would be improper and, arbitrary.

4 Your comment is noted.

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5 Comment 5:

The Montana Department of State Lands has proceeded upon an equivalent interpretation to that of the Office of Surface Mining regarding its statute. To change position on this interpretation and utilize any information in this description of the petition area section as the basis of any decision, would be improper and arbitrary.

5 Your comment is noted.

3. Chapter III. Evaluation of Coal Resources and Supply and Demand for Coal

A. Coal Resources

The first subsection of this chapter examines coal resources in the petition area.

6 Comment 6:

It is Burlington Northern's position that the draft decision

6 Your comment is noted.

document's conclusion that over three billion tons of coal would be precluded from mining by surface mining methods if the petition were granted in its entirety (understanding that the [illegible] of reserves has the margin of error noted in the [illegible] Data Accuracy and Reliability: Degree of Geologic Assurance) is based upon substantial evidence and is not arbitrary.

B. The Supply and Demand for Petition Area Coal

This subsection concludes that the cost of [illegible] 1995 coal demand with elimination of petition area coal could increase the national cost of coal by just over $100,000,000. This amount is then stated to be less than .001 percent of 1995 coal demand [illegible] if the petition area were removed from production.

7 Comment 7

Based upon model results, one interpretation of the information is that the total demand for coal is slight, and if the petition area were determined unsuitable for mining, economic effects would be inconsequential. However, it must be noted that the model used is national in scope. As such, it addresses [illegible] increased consumer cost on a national basis.

It should be emphasized that the document does not address the economic effect of granting the petition on the Montana economy. If the entire area were determined unsuitable, an estimated 3,484,000,000 tons of coal would not be mined. In such a case, coal severance taxes would not be collected by the state. At current rates, an amount in excess of an estimated $15,000,000,000 would not be collected by the State of Montana. This [illegible] should be included in this section.

In addition, it should be noted that economic effect of granting the petition is not in any way related to the primary issue of whether reclamation in the petition area is technically and economically feasible. Burlington Northern believes that granting the petition would result in a substantial adverse economic impact upon the nation and especially upon Montana. However, even a determination of an insubstantial adverse economic effect should not enter into the determination of the economic and technical feasibility of reclamation in the petition area.

4. Chapter IV. Description and Analyses of Petition Allegations

A. Hydrology

8 Comment 8

a) Clarification and Format

The decision document commences its response to the allegations in the petition, at A. 2, p. IV-2, under the heading

7 See change to text for "Social, Economic, and Community Services Background" (from chapter II of the draft document) in chapter II.

8 The use of the word "[illegible]" does not automatically assume that the area or system is poorly understood. It is valid to conclude from both the literature cited in the Beak report and the citations in the draft document that the hydrology of the area is [illegible] in terms of water quality in southeastern Montana.

"Unusual Hydrology of the Petition Area". It is Burlington Northern's position that the hydrology of the petition area is complex. Complexity is defined as "a whole made of ... interrelated parts". (Webster's New Collegiate Dictionary, 1956). Unusual is defined in the same publication as "Uncommon-Rare".

Complexity, however, does not have the same connotation as "unusual". To describe the hydrology of the petition area as "unusual" is to imply that it is unique and, hence, not well understood. Such is not the case. The hydrologic regime of land is detailed in Burlington Northern's Beak report, referred to above, contains over 60 citations to published materials. Consequently, to characterize the hydrology of the petition area as "unusual" in inappropriate.

The above discussion may appear to be an exercise in overreaction to a small matter, but it is not. In response to this difficulty, Burlington Northern has rewritten this section with the objective of providing clarity for this section.

In addition to merely substituting one word for another, Burlington Northern's proposed changes contain additions as well as deletions and substitutions. Additions have been inserted in order that necessary introductory material is available to the reader so that the conclusion can flow from analysis. Deletions and substitutions have been made for similar and other reasons. A summary of these additions, deletions and substitutions can be found at (e) of this comment, entitled Summary and Description of Revision Methodology. To improperly categorize phenomina is to arbitrarily characterize such phenomina and is improper.

b) Particular Inclusion

9 Comment 9:

Burlington Northern is opposed the addition of a listing of "general assumptions" to this section. This should be done in order that the point be clarified that the analysis in the document is based upon a model, and, as all models, is constructed from a mix of facts and assumptions, which must be set out. Wording to this effect is set forth in exhibits to this letter. Inclusion of this material is appropriate and is supported by the evidence in the draft decision.

c) Modeling

It should also be noted that models are utilized when data is incomplete. In the petition area, complete data for the entire area is unavailable. Hence, models were used and it is necessary to show the limitation of those models by stating their underlying assumptions or else the results of the modeling exercise could be misinterpreted or misconstrued. This approach clarifies the evidence utilized and to eliminate it could be arbitrary.

9 A clarification of modeling and assumptions is presented in Exhibit II.

10 Comment 10:

To clarify the matter, Burlington Northern requests the inclusion of an analysis of the models utilized in the draft decision document, as set forth in exhibits to this letter.

d) Conclusions

11 Comment 11:

Burlington Northern requests inclusion of the "conclusion" sections submitted. One of the purposes of the unsuitability provision in the statutes is to reach conclusions regarding unsuitability for reclamation. The draft document contained no conclusions in this subsection and Burlington Northern believes the conclusions suggested are reasonable ones based upon an objective analysis of the material contained in the draft document. As stated previously, suggested wording is set forth in Attachments to this letter. Inclusion of conclusions is supported by the evidence contained in the draft decision document.

e) Summary and Description of Revision Methodology

In summary of A-D above, Burlington Northern requests revision of the draft document to provide clarity of meaning, logical progression of analysis, and summation and conclusions regarding issues raised. In order that its comments be understood in the context of the draft report, Burlington Northern has attached two (2) exhibits to this comment letter.

Exhibit A is a clean copy of Burlington Northern's rationale for suggested wording.

Exhibit B is a marked copy of both the language of the draft document and suggested wording. This material, indicating each suggested change, is keyed to Exhibit A.

B. Vegetation and Soils

a. Style and Content

12 Comment 12:

As noted previously, introductory material is helpful in orientating the reader to the subsequent material. Here, the inclusion of authorities and literature cited is of assistance, and is to be commended. The well organized content, given the limitations of time in preparation of the document, is noteworthy.

b) "Shallow Soils"

It must be emphasized that the term "shallow soils" is used

10 A general discussion of the models is presented in chapter II. In addition, please see the published references and documentation cited, which analyze these models. DSL/OSM attempted to use the best available model. Thus far, it has not been demonstrated that the best available model was not used. No additional models were identified for use during the public comment period.

11 This final document is a decisionmaking tool and is not required to include the agencies' decisions on the petition treated herein. Written conclusions on the petition will be made available by DSL and OSM on or before December 21, 1981. The rationale and editing submitted by Burlington Northern are acknowledged.

12 Your comments are noted.

in the context of categorizing a soil by type based on soil classification system currently in use by the National Cooperative Survey (Soil Survey Staff, 1975). This national survey of lands provides soils information for general planning of county or multi-county districts.

13 Comment 13:

The use of the term "shallow" has no implication of any unfavorable attributes of the soil material itself which would limit suitability for use in reclamation, and it should be made clear in the draft document that the word "shallow" is not to be used to imply any negative attributes. To allow any such implication would be arbitrary.

c) Soil Depth

The discussion in the document of the allegations regarding soils points out the nature of evaluation of soil/overburden materials in the terms of suitability for use in reclamation. These attributes of soils are due to variability in materials. The document states that there are some materials (described in both stratigraphic and aerial extent) which are unsuitable within the petition area, but these unsuitable materials do not dominate the petition area in terms of either area or volume.

14 Comment 14:

It is Burlington Northern's position that this analysis is supported by the evidence in the draft decision document.

15 Comment 15:

Regarding limited volumes of suitable materials, the document points out that shallow soils can be a source of salvageable material to a minimum depth of approximately 6 inches, not 18 inches as suggested in the petition affadavit.

It is Burlington Northern's position that this analysis is supported by the evidence.

d) Salt Translocation

The document points out that studies are currently in progress to evaluate the long-term potential for adverse effects such as salt translocation problems.

16 Comment 16:

It is Burlington Northern's position that the discussion of current studies accurately reflects probative positive results regarding the handling of salt translocation problems and is supported by the evidence.

13 The discussion of shallow soils in the draft document, pages IV-32 and IV-33, was given with the intent of addressing only the allegation of the petition regarding shallow soils. No negative connotation was attached to shallow soils in this discussion; rather, the assumption was made that soils with less than 6 inches of suitable materials were considered to be unsalvageable.

14 The statement that "unsuitable materials do not dominate the petition area in terms of either area or volume" was not made in the draft document. Your comment is noted.

15 Your comment is noted.

16 Your comment is noted.

5. Chapter V. Alternative Actions

This chapter states that it "... provides descriptions and analyses of impacts of the five alternatives considered ...".

The document then lists the following alternatives:

A. Designate The Entire Petition Area As Unsuitable For All Surface Coal Mining Operations

B. Designate None Of The Petition Area As Unsuitable For Surface Coal Mining Operations

C. Conditional Designation Of Unsuitability

D. Designate The Entire Petition Area As Unsuitable For Surface Mining, But Allow Underground Mining

17 Comment 17:

It is Burlington Northern's position that an administrative decision which results in the selection of any of these alternatives must be supported by the appropriate quantum of evidence as provided by law. Based upon its analysis of the data, models, and information contained in the draft decision document, as well as its own studies, it is Burlington Northern's conclusion and position that none of the petition area can be determined unsuitable under any of the alternatives listed.

* * *

Burlington Northern invites careful scrutinizing of these comments.

In addition, Burlington Northern commends the effort expended on the draft document and thanks you in advance for your effort regarding these comments.

Very truly yours,

Thomas E. Root

Thomas E. Root
Project Manager
(406) 657-8368

TER/tlb

17 Your comment is noted.

EXHIBIT A

Exhibits: All items submitted in the BN exhibits are considered to be editorial revisions and, thus, have not been commented on. However, it should be noted that many of the BN suggested revisions are excellent.

OSM/OSL DRAFT DOCUMENT

A. HYDROLOGY

1. Introductory Comments

1 The major concern toward which the following allegations are directed is that "surface coal mining in the petition area could result in a substantial loss or reduction of long-range productivity of renewable resource lands, including water supply and food products." The petition contains statements in support of allegations. Some of these statements are included in order to set the state for the analysis of the allegations.

2. Response to the Allegations

2 Unusual hydrology of the petition area

3 Page 10, paragraph 21, states:

> "The Tongue River generally has the best overall water quality among streams in the coal region of southeastern Montana. Bateridge affadivit, Exh. 8, paragraph 5." This statement was also made by D. H. Hickox in his affidavit in support of the petition.

4 Water quality in the Tongue River from the Wyoming boundary to the Yellowstone River is classified as B-2e (Montana Water Quality Rules, ARM 16.20.601 through 16.20.645). This moderately high classification requires the river to be maintained for purposes of: drinking culinary, and food processing after conventional treatment; recreation and marginal propagation of salmonid fishes and associated aquatic life; and agricultural and industrial water supplies. The tributaries to the Tongue River in the petition area are all classified C-3, which is considered marginal for the uses listed above; degradation that will impact established beneficial uses is not allowable. Existing water quality of the Tongue River, as reported by Knapton and McKinley (1977 and Knapton and Ferreira (1980), meets nearly all of the EPA (1974, 1977) and Public Health Service standards (U.S. Department of Health, Education, and Welfare, 1962). The Tongue River Reservoir, developed for irrigation, regulates streamflow, reduces suspended sediments, and moderates the range of concentrations of other constituents (Knapton and McKinley, 1977). Thus, as water is released from the dam during the drier summer months, it dilutes and improves the lower quality baseflow (ground water contribution). 6

5

Data from Woessner and others (1980), Knapton and Ferreira (1980), and the Northern Great Plains Resources Program (U.S. Department of Commerce, 1974) indicate that the total dissolved solids (TDS) levels and concentrations of other parameters make the Tongue River one of the better quality streams for southeastern Montana and western North Dakota. The tributaries, of lesser water quality, are considered to be more characteristic of southeastern Montana.

7 8 Page 10, paragraph 22, states:

> "The area addressed by the petition is one of particular significance in the recharge, transmission, and discharge of groundwater into the Tongue River. Bateridge affadivit, Exh. paragraph 9."

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A HYDROLOGY

1. Introductory Comments

1 In the evaluation of the petition allegations relating to hydrology, information on the hydrologic system of the petition area and the region was used including evaluation of applicable models for impact evaluations. The most recent and up to date sources were considered from agencies most knowledgable with the Tongue River System and its hydrology including U.S. Geological Survey, Montana Bureau of Mines and Geology, Environmental Protection Agency, and Bureau of Land Management.

This section will address the petition allegations in a framework that will discuss the existing hydrology of the area, site-specific variability, the potential for long term and compounding impacts using hydrologic modelling, OLM studies within the petition area, and the relationship between hydrology, reclamation, and saline seeps.

Background

A summary statement of the allegations presented in the petition is that "surface coal mining on the scale contemplated in the petition area would adversely affect water quality and reduce the productivity of renewable resource agricultural lands in the petition area and downstream in the Tongue River Drainage.(Petition, Page 2-1.8)" The petition focuses on contemplated or potential surface coal mining as opposed to specific planned projects.

The existing condition of the hydrology of the Tongue River Drainage as discussed in Chapter II is relevant to this analysis section since it is input to any impact prediction.

The amounts of surface water flow in the Tongue River watershed are primarily dependent on precipitation and snowmelt in any given year. Tongue River Reservoir regulates flow in the main stem of the Tongue River such that peak flows are decreased and baseflows are increased through the petition area with some evaporation loss. Water lost by evapotranspiration of irrigated agriculture is a significant decreasing effect on the flow of the river even though some of the water is returning by movement through the local alluvial aquifer. Current surface coal mining in the watershed contributes small amounts of flow to the river from ground water storage.

Losses and contributions of water within the watershed result in an annual hydrograph of spring peak flows with summer, fall, and winter baseflow. Water gains are exceeding losses in the upper portions of the watershed while the reverse is true in the lower portions of the watershed resulting in a net decrease in flow in a downstream direction.

The effect of current mining on water quality in the Tongue River drainage is dynamically dependent on development location in relation to the river (Dettman and Olson 1977, Van Voast and Hedges 1975, Van Voast and Paschoot 1975, Van Voast and McDermott 1977, and Van Voast 1978). The changing water quality of the river through the petition area (Chapter II) is currently dynamic in nature. The projected impact of future mines in the petition area is also of a dynamic nature and highly variable.

Summary

As described above, the hydrologic system is inherently dynamic and variable which requires detailed hydrologic evaluations on a site specific basis. Since there are few specific projects proposed to date, few intensive studies that are required as part of a mining permit application have been completed. This lack of data necessitates the use of computer modelling for future projections. The strengths and weaknesses of modelling are discussed elsewhere in this section.

2. Response to the Allegations

2 Unusual hydrology of the petition area

3 [a] Page 10, paragraph 21, states

> "The Tongue River generally has the best overall water quality among streams in the coal region of southeastern Montana. Bateridge affadivit, Exh. 8, paragraph 5." This statement was also made by D. H. Hickox in his affidavit in support of the petition

4 Response

Water quality in the Tongue River from the Wyoming boundary to the Yellowstone River is classified as B-2e (Montana Water Quality Rules, ARM 16.20.601 through 16.20.645). This moderately high classification requires the river to be maintained for purposes of: drinking, culinary, and food processing after conventional treatment, recreation and marginal propagation of salmonid fishes and associated aquatic life, and agricultural and industrial water supplies. The tributaries to the Tongue River in the petition area are all classified C-3, which is considered marginal for the uses listed above. Surface water quality in the petition area varies with the seasons and with location (Knapton and Ferreira, 1980), owing to the changing contributions of ground water inflow, runoff and discharge from the reservoir. Water quality data for selected points on the Tongue River and its tributaries (Fig. II-1) are presented in Knapton and Ferreira (1980). The Tongue River Reservoir, developed for irrigation, regulates streamflow, reduces suspended sediments, and moderates the range of concentrations of other constituents (Knapton and McKinley, 1977). Thus, as water is released from the dam during the drier summer months, it dilutes and improves the lower quality baseflow (ground water contribution). 6 Climatic conditions influence the amount of water available for release.

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Data from Woessner and others (1980), Knapton and Ferreira (1980), and the Northern Great Plains Resources Program (U.S. Department of Commerce, 1974) indicate that the total dissolved solids (TDS) levels and concentrations of other parameters make the Tongue River one of the better quality streams for southeastern Montana and western North Dakota. The tributaries, of lesser water quality, are considered to be more characteristic of southeastern Montana.

7 8 [b] Pages 10 and 12 paragraphs 22 and 35, state

> "The area addressed by the petition is one of particular significance in the recharge, transmission, and discharge of groundwater into the Tongue River. Bateridge affidavit, Exh. paragraph 9."

9 [illegible] water in the petition [illegible] the moisture infiltrates and is weakly held by the [illegible] able to move beyond the root zone to recharge [illegible] believed to [illegible] from leaky streams and from percolation of moisture into [illegible] through the coarse rocky clinker zones. Support for these concepts [illegible] individuals who are familiar with drilling the Fort Union Formation in the vicinity of the petition area (Wayne Van Voast and Max Botz, oral common., 1981) as well as from a detailed hydrologic study done at the Westmoreland's [illegible] Resources, 1978). The idea that the lowlands (areas of strippable [illegible] not receive appreciable recharge is also supported by the fact that [illegible] tions generally occur within 3 to 10 feet of the surface in the soil column. If [illegible] percolation or recharge were occurring as the general case, then one would expect the salts to move down with the moisture.

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An infiltration study (OSM unpublished data, 1980) was [illegible] by OSM staff in undisturbed soils and replaced topsoils over spoil at the West [illegible] mine. The results of the study indicate that (for these site specific conditions) infiltration rates on topsoiled spoils were comparable to those of adjacent undisturbed soils. This indicates that the postmining soil surface can allow infiltration as part of the recharge process at a rate similar to that of the premining condition for areas that are not considered to be primary recharge zones. In the very permeable areas important to recharge (clinker and coarse soils) it is likely that reclamation effort will not be able to restore premining infiltration rates. 12

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Reduced runoff or recharge would likely result from mining and reclamation in those areas having large amounts of clinker, as alleged in Andrews' and Osborne's supporting affidavits. The amount of clinker in the petition area is not unusual in the northern Powder River Basin coal region. DSL and OSM have determined that about 20 percent of the petition area ([illegible],860 acres) is clinker, of which only about 2.7 percent (1,060 acres) would be disturbed if all surface minable coal were extracted. Those clinker areas that may be disturbed are a small part of the total and are dispersed through the central portion of the petition area and the Otter Creek drainage. Thus, mining would not significantly affect recharge through this source.

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DSL and OSM experience to date indicates that, where leaky streams provide part of the recharge to ground-water systems, there is no reason to believe that drainages restored after mining will not continue to lose water into the ground water system.

Woessner and others (1980, v. 1, p. 161) identified the ground-water discharge as a composite of "discharge from bedrock, clinker, and alluvial aquifers to the river" and that ground-water discharge to the Tongue River "occurred at various rates along selected reaches depending on the proximity to higher precipitation zones and presence of geologic materials with good aquifer characteristics." Woessner and others (1980) reported various ground-water inflow rates ranging from losses below Brandenberg to gains in excess of 1.2 cfs per river-mile upstream between Brandenberg and Birney Day School (Woessner and others, 1980, v. 1, p. 161-165). (See table IV-1 and fig. II-1.) Woessner identified the greatest amount of ground-water discharge to the river along a reach between Birney Day School and 6 miles north of the Northern Cheyenne Reservation (Woessner and others, 1980, v. 1, p. 165). Andrews and Osborne indicated that the Tongue River, "unlike most other streams in the region, receives measurable quantities of groundwater inflow." They estimated that the inflow ranges

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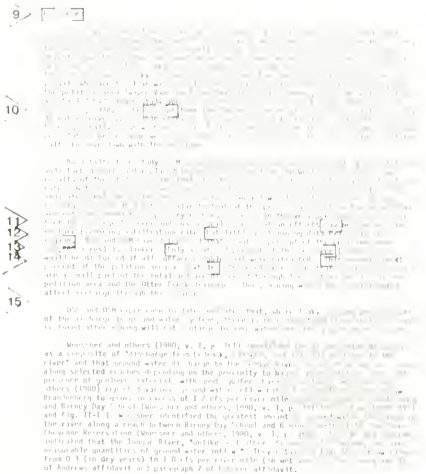
[illegible]

Woessner and others (1980, v. 1, p. [illegible]) [illegible] as a composite of "discharge from bedrock, [illegible] river" and that ground-water discharge to the Tongue River [illegible] along selected reaches depending on the proximity to [illegible] presence of geologic materials with good aquifer [illegible] others (1980) reported various ground-water [illegible] Brandenberg to gains in excess of 1.2 cfs per river-mile [illegible] and Birney Day School (Woessner and others, 1980, v. 1, p. [illegible] and fig. II-1.) Woessner identified the greatest amount [illegible] the river along a reach between Birney Day School and 6 [illegible] Cheyenne Reservation (Woessner and others, 1980, v. 1, p. [illegible]) indicated that the Tongue River, "unlike [illegible] measurable quantities of ground-water inflow." They [illegible] from 0.3 (in dry years) to 1.0 cfs per river-mile (in wet [illegible] of Andrews affidavit and paragraph 7 of [illegible] affidavit.



from 0.3 (in dry years) to 1.0 cfs per river-mile (in wet years). See paragraph 12 of Andrews affidavit and paragraph 7 of Osborne affidavit.

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In conclusion, mining will have a slight impact on the portions of the petition area that are considered to be significant recharge areas (clinker in the upland areas, losing streams, and areas of coarse rocky soils). This portion of the Tongue River apparently has a greater gain in ground-water discharge than do other reaches of the river in Montana; however, current data from existing mines do not indicate that mine spoil will be a barrier to ground-water flow (Van Voast, 1978). Thus, DLS's/OSM's analyses indicate ground-water flow rates will continue to be the same after mining as before.

17 Present quality and use of water

18 Page 10, paragraphs 23, 24, and 25, states:

> "Surface water from the Tongue River irrigates 24,082 acres below the mouth of Hanging Woman Creek. Additional irrigable land has been identified along the Tongue River. See Exhibit 2 ***. Residences, farms, and ranches, and the community of Ashland derive water from the Tongue River alluvium for domestic and agricultural use. Bateridge affidavit, Exh. 8, paragraph 7 ***. The Tongue River member aquifers in the petition area are used by farms and ranches, which depend on it for survival. The ground water in these aquifers is barely adequate, both quantitatively and qualitatively, for domestic and agricultural uses. See Bateridge affidavit, Exh. 8, paragraph 7."

These paragraphs present baseline information rather than allegations and are therefore discussed in chapter II. They are included here in order that they may be read in context with the following allegation.

19 Long-term potential degradation of water quality

20 Page 10, paragraph 26, and page 11, paragraphs 27 and 28, allege:

> "Large scale mining in the petition area would cause significant regional changes. Most of the shallow groundwater in mined areas, plus part of the downstream regions, would be of marginal use for stock and undesirable for other uses. See Bateridge affidavit, Exh. 8, paragraph 12. Deterioration of marginal aquifers and degradation of water in the Tongue River alluvium would destroy the agricultural productivity of the affected areas ***. Large scale mining in the area addressed by the petition would have a deleterious effect on the water quality of the Tongue River water. Bateridge affidavit, Exh. 8, paragraphs 10 and 12 ***. The effects on the Tongue River water quality from large scale mining in the petition area would appear gradually over a period of years and become observable only after it is too late to remedy the damage or cause. Water quality degradation from surface mining along the Tongue River would continue for hundreds of years, long after the mines cease production. See Bateridge affidavit, Exh. 8, paragraph 13."

16 Conclusion

In conclusion, mining will have a slight impact on the portions of the petition area that are considered to be significant recharge areas (clinker in the upland areas, losing streams, and areas of coarse rocky soils). This portion of the Tongue River apparently has a greater gain in ground-water discharge than do other reaches of the river in Montana; however, current data from existing mines do not indicate that mine spoil will be a barrier to ground-water flow (Van Voast, 1978). Thus, DLS's/OSM's analyses indicate ground-water flow rates will continue to be the same after mining as before.

17 Potential long term effects on water quality

18 [a] Page 10, paragraphs 23, 24, and 25, states.

> "Surface water from the Tongue River irrigates 24,082 acres below the mouth of Hanging Woman Creek. Additional irrigable land has been identified along the Tongue River. See Exhibit 2 ***. Residences, farms, and ranches, and the community of Ashland derive water from the Tongue River alluvium for domestic and agricultural use. Bateridge affidavit, Exh. 8, paragraph 7 ***. The Tongue River member aquifers in the petition area are used by farms and ranches, which depend on it for survival. The ground water in these aquifers is barely adequate, both quantitatively and qualitatively, for domestic and agricultural uses. See Bateridge affidavit, Exh. 8, paragraph 7."

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[illegible] alternatives, [illegible] are a best estimate of the impacts of mining, using [illegible] data. In all cases, the assumptions are very conservative and generally [illegible] worst case conditions. The analyses also assume that the water quality [illegible] of all [illegible] mining would occur at the same time. The calculations [illegible] are a reasonable use of the data that are available for consideration by the [illegible].

[illegible] of Land Management's analysis for Otter Creek. The BLM [illegible] the [illegible] of mining the proposed lease tracts on Otter Creek to (1) shallow (Tongue River Member) aquifers disturbed by mining and to (2) the alluvial ground water of Otter Creek (BLM's response to the petition, appendix C). They concluded that water from the spoil would contribute an average [illegible] of 1,91[illegible] mg/L TDS, thus [illegible] TDS to 3,65[illegible] mg/L in shallow Tongue River Member aquifers. This increase would [illegible] waters considered good for livestock use before mining [illegible] for [illegible] use after mining (McKee and Wolf, 1971). The ground water quality in the spoil was then predicted to increase TDS levels in the Otter Creek alluvial [illegible] by an average of 1,[illegible] mg/L. This would raise the average premining alluvial water TDS levels to 4,[illegible] mg/L. [illegible] present alluvial water quality, based on TDS levels, is considered to be poor for irrigation use (U.S. Salinity Laboratory, 1954) but is suitable for livestock water (McKee and Wolf, 1971). An increase in TDS to the predicted levels would render the alluvial water unfit for livestock water (McKee and Wolf, 1971). The salinity hazard for the alluvial water would be considered very high for irrigation use as it is presently (U.S. Salinity Laboratory, 1954). However, the current practice of [illegible] higher quality spring runoff for use later in the year could still allow for irrigation and livestock watering.

Mining in the vicinity of Otter Creek was predicted to increase the TDS levels in the Tongue River 3 to 36 mg/L, depending on the flow rate. An increase of this magnitude, by itself, is not significant to the Tongue River water quality.

Salinity and flow modelling. Van Voast predicted water quality changes for (1) the shallow Tongue River Member aquifers and (2) the Tongue River alluvium (appendix O). He further predicted postmining ground-water quality for shallow Tongue River Member aquifers in areas to be disturbed by mining or downgradient from mined areas. His projections, based on saturated extracts of the upper 50 feet of overburden (appendix E), show that the postmining spoil water quality would have a specific conductance (SC) equal to the premining SC (estimated at 3,300 umhos/cm) plus that contributed by the spoils (estimated at 4,730 to 5,530 umhos/cm). Using a conversion factor of 0.7 (appendix C), the postmining projected range in TDS is 5,621 to 6,181 mg/L compared with the estimated premining level of 2,310 mg/L. This change in quality would result in shallow ground waters in the Tongue River Member that, while considered good for livestock watering before mining, would be considered unfit for such use after mining (McKee and Wolf, 1971). Alternate sources of waters are available below the Lebo Shale. (See chapter II.)

As part of DSL's/OSM's analysis of this allegation, mathematical salinity and flow modelling techniques were also used by Van Voast to estimate the effect of surface mining on the long-term degradation of water quality in the Tongue River alluvium (appendices A and O). Preliminary results indicate a predicted increase in SC of 920 to 2,090 umhos/cm above the present mean levels of 1,490 umhos/cm in the alluvial water along the river in the petition area. Using a conversion factor of 0.7, the conductance values convert to an average of approximately 644 to 1,463 mg/L TDS.

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[illegible]

All [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

9. [illegible]

10. [illegible]

11. [illegible] will [illegible]

[illegible] ...nts taken from [illegible] of the [illegible] ...ent

Appendix E [illegible] and 14, Bureau of [illegible].

"The hydrologic evaluation [illegible] should be [illegible] approximation rather than precise prediction and is not [illegible] a more detailed analysis of the hydrologic impacts of [illegible] which [illegible] mine plan development and review" ... When [illegible] inputs it is important to note the [illegible] analysis [illegible] This is a very unlikely [illegible] ...tly biases the analysis results ..."

Appendix D 9 - Montana Bureau of Mines and Geology.

"Acknowledging the frailties of the mass balance approach and [illegible] sensitivities to various inputs, the calculated changes to water quality should be treated only as a generality. Application to real proposed mines without highly specific data would more than likely give strongly misleading results."

(COMMENTS 23-31 ON NEXT PAGE)

The following techniques, used to make predictions of the quality of postmining ground and surface waters, are a best estimate of the impacts of mining, using limited data. In all cases, the assumptions are very conservative and generally considered worst-case conditions. The analyses also assume that the water quality impacts of all anticipated mining would occur at the same time. The calculations made are a reasonable use of the data that are available for consideration by the decisionmaker.

23 Bureau of Land Mangement's analysis for Otter Creek. The BLM predicted the impacts of mining the proposed lease tracts on Otter Creek to (1) shallow (Tongue River Member) aquifers disturbed by mining and to (2) the alluvial ground water of Otter Creek (BLM's response to the petition, appendix C). They concluded that water from the spoil would contribute an average increase of 1,912 mg/L TDS, thus elevating TDS to 3,652 mg/L in shallow Tongue River Member aquifers. This increase would make waters considered good for livestock use before mining poor for such use after mining (McKee and Wolf, 1971). The ground water quality in the spoil was then predicted to increase TDS levels in the Otter Creek alluvial system by an average of 1,650 mb/L. This would raise the average postmining alluvial water TDS levels to 4,700 mg/L. The present alluvial water quality, based on TDS levels, is considered to be poor for irrigation use (U.S. Salinity Laboratory, 1954) but is suitable for livestock water (McKee and Wolf, 1971). An increase in TDS to the predicted levels would render the alluvial water unfit for livestock water (McKee and Wolf, 1971). The salinity hazard for the alluvial water would be considered very high for irrigation use as it is presently (U.S. Salinity Laboratory, 1954). However, the current practice of impounding higher quality spring runoff for use later in the year could still allow for irrigation and livestock watering.

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25 Salinity and flow modelling. Van Voast predicted water quality changes for (1) the shallow Tongue River Member aquifers and (2) the Tongue River alluvium (appendix D). He further predicted postmining ground-water quality for shallow Tongue River Member aquifers in areas to be disturbed by mining or downgradient from mined areas. His projections, based on saturated extracts of the upper 50 feet of overburden (appendix E), show that the postmining spoil water quality would have a specific conductance (SC) equal to the premining SC (estimated at 4,300 umhos/cm) plus that contributed by the spoils (estimated at 4,730 to 5,540 umhos/cm). Using a conversion factor of 0.7 (appendix C), the postmining projected range in TDS is 5,621 to 6,181 mg/L compared with the estimated premining level of 2,310 mg/L. This change in quality would result in shallow ground waters in the Tongue River Member that, while considered good for livestock watering before mining, would be considered unfit for such use after mining (McKee and Wolf, 1971). Alternate sources of waters are available below the Lebo Shale. (See chapter 11.)

As part of OSM's/OSM's analysis of this allegation, mathematical salinity and flow modelling techniques were also used by Van Voast to estimate the effect of surface mining on the long-term degradation of water quality in the Tongue River alluvium (appendices A and D). Preliminary results indicate a predicted increase in SC of 920 to 2,090 umhos/cm above the present levels of 1,490 umhos/cm in the alluvial water along the river in the petition area. Using a conversion factor of 0.7, the conductance values convert to an average of approximately 644 to 1,463 mg/l TDS.

23 [illegible]

24 [illegible]

25 Van Voast Modelling Analysis [illegible]

26 [illegible]

27 [illegible]

28 [illegible]

29 [illegible]

30 [illegible]

31 [illegible]

When the predicted increase in TDS is added to the [illegible] level for the stream, the result is a range (after mining) of 1,687 to 2,506 mg/L TDS. These TDS levels present a very high salinity hazard for irrigation (U.S. Salinity Laboratory, 1954), although it would be considered as fair for livestock watering (McKee and Wolf, 1971).

32 TDS modelling. Computer modelling of TDS levels was done to project long-term available data and expanded upon previous models, such as that used by Woessner and others (1980) and Sherrini and Summers (1979). Validation of this model indicated
33 it closely tracked historic conditions. Much of the input data was derived from Knapton and Ferreira's (1980) studies in the Tongue River Basin.

A refined total minable acreage value will be used in the final and is expected to reduce projected Tongue River TDS levels. The final computer runs will only consider effects from anticipated mining upstream and from areas projected to be mined within the petition area. The input to the computer model will also be refined using projections of spoil water-quality data from overburden chemistry data from OSM/OSL drilling project.

Several computer runs were made using different development levels. These include (1) the effects of mining along Otter Creek, (2) the effects from increased return flow due to agricultural developments, (3) the effects from intensive mining, and (4) the effects from both (a) increased return flow due to agricultural development and (b) intensive mining.

The initial computer run projected the effect of mining 33,731 acres of coal along Otter Creek. Preliminary results are shown in table IV-2. Projections show
34 that mining the lease tracts near Otter Creek would substantially increase the dissolved solids concentration in Otter Creek, especially when streamflows are less than the mean. In the main stream Tongue River, the effects of such mining would likely be undetectable at mean streamflow. Even at reduced streamflow, irrigation water withdrawals from the main stream Tongue River would be of suitable quality after mining the proposed Otter Creek lease tracts (table IV-2).

A second computer run was used to project water-quality effects resulting from increase return flow from agricultural development due to enlargement of the Tongue River Dam. Table IV-3 shows the preliminary results of simulating instream discharge requirements for both the existing and the proposed reservoir. This projected reduction in streamflow to the instream discharge, in addition to the return flow, causes a projected rise in total dissolved solids concentrations; however, the change in TDS
35 will not cause the water to be unsuitable for its current uses.

The third model run incorporated more intensive (potential) mining levels listed in table IV-4. The results of this simulation are shown in tables IV-5 and IV-6. With the proposed reservoir releasing mean streamflow, the range of dissolved-solids concentrations in reach No. 5 (fig. IV-1) is 225 to 647 mg/L with mining and 222 to 623 mg/L without mining. These increased TDS levels are insignificant to irrigation; however, the concentrations rise appreciably when the flow is reduced to minimum
36 instream requirements set by the State for wildlife purposes. At this lower flow rate, the salinity hazard for irrigation would be high to very high throughout the entire growing season.

32 [illegible] Survey

[illegible] modelling of TDS levels was done to project long-term [illegible] water quality [illegible] Sherrini and Summers (1979). Much of the input data was derived from Knapton and Ferreira's (1980) studies in the Tongue River Basin.

A refined total minable acreage value will be used in the final and is expected to reduce projected Tongue River TDS levels. The final computer runs will only consider effects from anticipated mining upstream and from areas projected to be mined within the petition area. The input to the computer model will also be refined using projections of spoil water-quality data from overburden chemistry data from OSM/OSL drilling project.

Several computer runs were made using different development levels. These include (1) the effects of mining along Otter Creek, (2) the effects from increased return flow due to agricultural developments, (3) the effects from intensive mining, and (4) the effects from both (a) increased return flow due to agricultural development and (b) intensive mining.

The initial computer run projected the effect of mining [illegible] along Otter Creek. Preliminary results are shown in table IV-2. Projections show
34 that mining the lease tracts near Otter Creek would substantially increase the dissolved solids concentration in Otter Creek, especially when streamflows are less than the mean. In the main stream Tongue River, the effects of such mining would likely be undetectable at mean streamflow. Even at reduced streamflow, irrigation water withdrawals from the main stream Tongue River would be of suitable quality after mining the proposed Otter Creek lease tracts (table IV-2).

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35 would still result in water suitable for current uses.

The third model run incorporated more intensive (potential) mining levels listed in table IV-4. The results of this simulation are shown in tables IV-5 and IV-6. With the proposed reservoir releasing mean streamflow, the range of dissolved-solids concentrations in reach No. 5 (fig. IV-1) is 225 to 647 mg/L with mining and 222 to 623 mg/L without mining. These increased TDS levels are insignificant to irrigation;
36 At minimum instream flow rates, the salinity hazard for irrigation would be high to very high throughout the entire growing season.

Water quality in the Tongue River at mean streamflow, under [illegible] of intensive mining along both the Tongue River and Otter Creek would remain usable for irrigation at these elevated dissolved-solids concentrations. Intensive mining and increased agricultural development would combine to indicate that during the early part of the growing season (May through July), the additions of TDS are minor (tables IV-7 and IV-8). However, in August and September (during periods of low flow), the projected increases in TDS significantly elevate the salinity hazard for irrigation.

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The analyses thus far indicate that the shallow Tongue River Member aquifers directly affected by, or downgradient from, mining will have the greatest increase in TDS due to mining. Waters from these shallow aquifers that were considered good for livestock use prior to mining would be poor to unsuitable for livestock use after mining. In these areas, the water supply that would be necessary to support the postmining land use would have to be obtained from deeper sources, possibly below the Lebo Shale. (See discussion of water supplies in chapter II.) Completing wells into the deeper aquifers would be more expensive owing to the increased drilling and pumping depth and also the unstable nature of spoil making drilling more difficult.

Alluvial ground waters were predicted to have the next greatest increase in TDS as a result of mining. The salinity hazard of the alluvial waters for irrigation use in both drainages would remain high or would be increased to very high after mining. The suitability of the alluvial waters for livestock use, considered good prior to mining, would remain good along the Tongue River and would degrade to fair along Otter Creek after mining.

The estimates of water quality summarized above are not expected to be reduced (based on the refinement of overburden quality and extent of mining data now available).

Preliminary projections indicate that mining will have the greatest effect on the Tongue River during periods of low flow (August through September) or when water levels are reduced to the instream flow reserved for aquatic life. The evaluation of the effects of increased development (including maximum mining and/or irrigation along the Tongue River) indicates that the quality of flow in the Tongue River would, during periods of low flow, be considered a high to very high salinity hazard for irrigation (August through September). The projected worst-case impacts are considered long term. Because an extremely high estimate of recoverable coal acreage was used, actual conditions would be somewhat less than projected.

38 Cumulative Impact on the Tongue River

39 The allegations below address mining upstream from the petition area, the new
40 Tongue River Dam, and additional water consumption, all of which might worsen the
41 effects of coal mining on the Tongue River.

42 43 Page 11, paragraphs 29 and 30, allege:

> "Reduced stream flows in the Tongue River which would result from climatic conditions and increased withdrawals upstream for irrigation, municipal, or industrial uses would accelerate the decline in water quality. See Bateridge affidavit, Exh. 8, paragraph 16 ***. The State of Montana is considering several alternatives for repairing the Tongue River Dam which

would entail lowering the firm annual water supply for several years. Should this occur, reduced streamflows would aggravate the degradation of water quality in the Tongue River. See Bateridge affidavit, Exh. 8, paragraphs 14 and 16."

44 45 The previously described computer runs of the U.S. Geological Survey model have taken into account the most likely alteration to the Tongue River Dam presented to the 1981 session of the Montana Legislature. The conclusions based on these preliminary results indicate that the effects of the modified Tongue River Dam and increased irrigation would have the greatest impact during periods of low flow (August through

46 September). The alterations to the Tongue River Dam should not lower firm annual yield for a number of years. No projections of increased industrial withdrawals have

47 been made due to a lack of information to support additional consumption. There is also a lack of data on increased municipal withdrawals. The assumption is made that 7,000 additional acres would be irrigated with the additional water stored by the new

48 dam (Rick Bondy, oral commun., 1981). Additional computer runs will be made as scenarios are refined to include other developments to further evaluate the effect of reduced streamflows on water quality. 49

50 Page 11, paragraph 31, and page 12, paragraphs 32 and 33, allege:

> "Strip mining operations are currently taking place on the Tongue River basin upstream from the petition area at the following mines in Montana and Wyoming: Decker East, Decker West, Spring Creek, Big Horn, Ash Creek, and Welch ***. Additional mines are proposed or expected in the Tongue River basin upstream from the petition area. These include North Decker, Consol CX Ranch, PkS CX Ranch, Shell Young's Creek, and Amoco, with a total anticipated annual production capacity of 32.4 million tons per year by 1990 ***. Mines upstream from the petition area, both ongoing and likely additional operations, would compound the deleterious effects on the Tongue River from mining in the petition area. See Bateridge affidavit, Exh. 8, paragraph 16."

51 Van Voast (1975), at the Montana Bureau of Mines and Geology, predicted the water quality impacts of mining at the Decker West, East, and North mines on the Tongue River (table IV-9). These projected impacts are being incorporated into a run

52 of the U.S. Geological Survey model by using the projected monthly altered water qualities as the input for the model (outflow from the Tongue River Dam).

Ongoing work at the Montana Bureau of Mines and Geology is being done to project the impacts of all anticipated mining in the Decker area and, as this work becomes available, it will be used in the Geological Survey model to provide insight into both the impacts of mining within and upstream from the petition area.

A review of mining and reclamation plans submitted to OSM and DSL indicates that

53 the following mines are proposed for the Tongue River valley:

Mine*	Operator	State	Status
North Decker	Decker Coal Co.	Montana	Mine plan submitted.

44 [illegible] have [illegible] the most likely alteration to the Tongue River Dam [illegible] to the [illegible] session of the Montana Legislature. The conclusions based on these preliminary results indicate that the effects of the modified Tongue River Dam and increased irrigation would have the greatest impact during [illegible] of low flow (August [illegible] 45

46 September) [illegible]. The alterations to the Tongue River Dam [illegible] lower firm annual yield for a number of years. No projections of increased industrial withdrawals have been made due to a lack of information to support additional [illegible] consumption. There is also a lack of data on increased municipal

47 withdrawals. The assumption is made that 7,000 additional acres would be irrigated with the additional water stored by the new dam (Rick Bondy, oral commun., 1981).

48 Additional computer modelling will be conducted as scenarios are refined to include other developments to further evaluate the effect of reduced streamflows on water quality. However, data are too minimal to date for even meaningful computer modelling analyses.

49

50 [illegible] Page 11, paragraph 31, and page 12, paragraphs 32 and 33, allege:

> "Strip mining operations are currently taking place on the Tongue River basin upstream from the petition area at the following mines in Montana and Wyoming: Decker East, Decker West, Spring Creek, Big Horn, Ash Creek, and Welch ***. Additional mines are proposed or expected in the Tongue River basin upstream from the petition area. These include North Decker, Consol CX Ranch, PkS CX Ranch, Shell Young's Creek, and Amoco, with a total anticipated annual production capacity of 3_.4 million tons per year by 1990 ***. Mines upstream from the petition area, both ongoing and likely additional operations, would compound the deleterious effects on the Tongue River from mining in the petition area. See Balerdge affidavit, Exh. 8, paragraph 16."

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52 River (table IV-9). These projected impacts are being incorporated into the Woods U.S. Geological Survey model by using the projected monthly altered water qualities as the input for the model (outflow from the Tongue River Dam).

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A review of mining and reclamation plans submitted to OSM and DSL indicates that

53 the following mines are proposed for the Tongue River drainage:

Mine	Operator	State	Status
North Decker	Decker Coal Co.	Montana	Mine plan submitted.
Consol CX Ranch	Consolidation Coal	Montana	Baseline investigations underway, application anticipated, fall 1981
PkS CX Ranch	Peter Kiewit and Sons	Montana	Baseline investigations underway.
Young's Creek	Shell Oil Co.	Montana (Crow Indian Reservation)	Proposed draft leasing EIS published, February 1981.
Welch No. 1	Sheridan Enterprises, Inc	Wyoming, Tongue River, T. 57 N. R. 84 W. secs. 2 and 3	State Permit No. 497, approved November 1979

56

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Welch No. 1	Sheridan Enterprises, Inc.	Wyoming, Tongue River, T. 57 N., R. 84 W., secs. 2 and 3	State Permit No. 497, approved, November 1979.

* In addition, Amoco has indicated an interest in mining an area along the upper reaches of Hanging Woman Creek.

54 Therefore, it is not possible to draw a conclusion at this time; a response to this allegation will be made in the final evaluation document.

55 Reclamation failure/increased sediment loads

56 Page 9, paragraph 20, states:

> The combination of poor soil structure and the lack of vegetative cover which would result if reclamation fails would increase the susceptibility of soils to wind and water erosion. Opper affidavit, Exh. 9, paragraph 18."

57 Page 12, paragraph 34, alleges:

> "If reclamation attempts fail in the petition area, increased sediment loads might result which would further degrade water quality in the Tongue River. See Bateridge affidavit, exh. 8, paragraph 15. See also Opper affidavit, Exh. 9."

Opper concluded, based on the assumptions mentioned in paragraph 20, that revegetation will be unsuccessful due to the high percentage of sodic clays in the soils and overburden. The soils portion of this chapter conclude that the allegations, to the effect that sufficient quantities of salt-free soils and overburden needed for revegetation cannot be found in the petition area, cannot be substantiated.

OSM unpublished data from 40 infiltration and run-off plot observations, using a Rocky Mountain Infiltrometer, indicate that, after 5 years from initial seeding, under the site-specific conditions at the West Decker mine, reclamation efforts can be successful in restoring infiltration rates and stabilizing topsoils comparable to that of unmined adjacent areas. The sites selected for observation had gradual slopes, loamy textured soils, and vegetative covers all representative of the area.

SURFACE WATER SEDIMENT

[illegible] Item 1 of his affidavit indicated that the annual gain in suspended load is "only 43 tons per square mile in the reach of the Tongue River between the dam and Brandenberg, whereas the gain is [illegible] downstream of Brandenberg." He compared these gains to the Powder River at Arvada ([illegible] tons/mi²) and to the Bighorn River near Hardin ([illegible]00 tons/mi²). Knapton and Ferreira (1980) pointed out that the Tongue River Reservoir acts as a sediment trap, and thus the river downstream from the dam is relatively free of suspended solids (Knapton and Ferreira, 1980, p. 7). Their data show an increase in suspended solids in the downstream direction such that, at Miles City, the concentrations range from 5 to 4,360 mg/L with a mean of 42[illegible] mg/L (Knapton and Ferreria, 1980, p. [illegible]). (See also Knapton and McKinley, 1977; U.S. Geological Survey and Montana Department of State Lands, 1979; Missouri River Basin Comprehensive Framework Study, 1971, v. 7, p. [illegible]). Knapton and Ferreir also stated that only Sarpy and Armells Creeks had lower mean concentrations in the study area.

Knapton and McKinley (1977) stated that the Tongue River Reservoir largely controls the amount of suspended sediment in the river near the confluence of Hanging Woman Creek. However, they noted that by the time the river reaches Miles City sediments has become readily available, particularly when streamflows exceed 500 cfs. At Miles City, streamflow is frequently this high, while upstream flows are generally lower. It appears that at 500 cfs the river begins to be able to pick up bed and bank materials, which would explain the sudden increase in sediment concentrations at flow rates above this threshold. In addition, the textural analyses of sediment samples indicate that at high flow 80 percent of the sediment consisted of silt and clay. It takes more energy for a stream to entrain the extremely fine sediment fractions, which also supports the concept that sediment loads are more closely related to streamflow (particulary above 500 cfs) than to the amount of clinker in the basin as the petition alleges. In addition, lithologic changes (Lebo Shale and Tullock Members of the Fort Union Formation) occur below Brandenberg Bridge that could make sediment yield higher than in the petition area. Runoff rates and sediment yields are influenced by many factors of which clinker is but one. The petition area does not necessarily stand out as having high infiltration rates and low sediment yields direclty related to the amount of clinker present. In conclusion, it is not clear that low sediment yields for the portion of the Tonque River that traverses the petition area are closely related to the amount of clinker present in the area.

In addition to the petition items, the Andrews affidavit (No. 20) states that the during-mining sediment control measures would prevent increases in suspended sediments being contributed off active mine areas. However, the affidavit further contends that in the long term (after removal of sedimentation ponds, etc.), increased concentrations in suspended solids are inevitable. The reasons cited are the unconsolidated fine-grained spoils which would be easily eroded when headcuts develop.

Headcutting is a natural phenomenon in the semiarid West (Patton and Schumm, 1975) and almost every drainageway flows through accumulations of unconsolidated valley fill (not much different than unconsolidated spoil). If drainages are correctly designed (according to Montana's surface mining rules), reclamation of drainageways should be successful. Reclamation may even be considered successful if headcuts form, as long as the sediment yield from the reclaimed area was not greater than the premining rate. The fact that the postmining topography generally has gentle slopes and less potential energy available for erosion provides additional

-9-

support that erosion and sediment yield might not be accelerated as a result of mining.

58

A mining operation's compliance with Montana's law and surface mining rules regarding reclamation and sedimentation will prevent increased erosion and sediment yield resulting from acceleration mining. It should be noted that, in Montana, if a reclamation failure occurs, the company involved risks not only the monetary loss of its bond, but also its ability to ever mine coal in the State again.

It appears that the potential for reclamation success in the petition area is good, and the risk of a reclamation failure no greater than at other mines permitted to date in Montana. (See the accompanying section, Soils and Vegetation).

Saline-seep development

59 Page 9, paragraph 19, states:

> "The effects of salt translocation often take decades to manifest themselves. Evidence indicates that burial of salty or sodic material by relatively nonsaline topsoil may only postpone consequences (Opper affidavit, exhibit 9, paragraph 11). Surface mining and reclamation technology in the Northern Great Plains is too recently developed to lend the long term perspective necessary to assess the effects of burying sodic materials."

The soils portion of this chapter responds to the upwards translocation of salts in soils. Several points concerning the potential for saline seeps as a result of mining were raised in the affidavits (Osborne, paragraph 14; Andrews, paragraphs 14, 21, and 22) and are addressed here. The affidavits state that saline seeps develop gradually, and, therefore, it is not surprising that no saline seeps are known to be associated with mine spoils in Montana and Wyoming. They further contend that saline seeps are likely to form in reclaimed spoil areas that are hummocky as a result of discharge and evaporation from small ground-water flow systems that develop. According to the Andrews affidavit (No. 21), these saline seeps would result in significant productivity declines.

(Saline seeps from where shallow ground water is held near the soil surface and water losses occur due to evapotranspiration, leaving a concentration of salts that had previously been in solution). The scenarios of saline-seep development commonly conveyed involved fallow crop rotation where excess moisture becomes available and is lost to deep percolation. The excess moisture moves down to an impermeable saline shale, where it takes salts into solution and begins to migrate laterally to a discharge point. At the discharge point, evapotranspirative losses cause the concentration of salts, resulting in a saline seep. It is important to note that although the concentration of dissolved constitutents plays a role in the formation of saline seeps, the overriding factors are the geologic/hydrologic conditions that allow the slow evaporative loss of shallow ground water (Marvin Miller, Montana Bureau of Mines and Geology, oral commun., 1981). In some circumstances saline seeps have been documented where the contributing ground waters contain as little as 1,000 mg/L TDS (Montana Bureau of Mines and Geology staff, oral commun., 1981).

In order for a saline seep to develop, excess moisture must first be available to percolate beyond the root zone. The permanent diverse vegetative communities

58 Conclusion

A mining operations compliance with Montana's law and surface mining rules regarding reclamation and sedimentation will prevent increased erosion and sediment yield resulting from accelerated mining. It should be noted that, in Montana, if a reclamation failure occurs, the company involved risks not only the monetary loss of its bond, but also its ability to ever mine coal in the State again.

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In order for a saline seep to develop, excess moisture must first be available to percolate beyond the root zone. The permanent diverse vegetative communities required by Montana's law should root at various depths and be very effective at utilizing all the moisture supplied to the soil profile. So, in general, not much moisture will percolate beyond the root zone. In support of this, soils are observed to accumulate in well developed natural soils profiles in the area, at about 36 to 60 inches in depth. Apparently, native vegetation has utilized the additions of moisture and prevented the downward movement of moisture (and salts) below the root zone. The overburden data (see the discussion of overburden, under Vegetation and

[illegible] by [illegible] would root at [illegible] depth [illegible] be very effective at utilizing all the moisture supplied to the soil profile. So, in general, not much moisture will [illegible] beyond the root zone. In support of this, salts are observed to accumulate in well developed natural soils profiles in the area, at about 30 to [illegible] inches in depth. Apparently, native vegetation has utilized the additions of moisture and prevented the downward movement of moisture (and salts) below the root zone. The overburden data (see the discussion of overburden, under Vegetation and Soils, in this chapter) for the petition area indicate that there is, on the average, more than 8 feet of suitable [illegible] materials available over the area. Thus, there should be little problem with plants attaining their full rooting depth.

There will be some limited circumstances, such as a snowbank of the lee side of a ridge, where moisture would escape the root zone and be available to contribute to a saline seep. In these circumstances, the [illegible] must be able to move [illegible] an [illegible] zone to a discharge point or be held at the surface in order for a saline seep to develop. As mentioned in the previous paragraph, at least 8 feet of suitable materials are available, and would not inhibit movement of water according to the criteria of Dollhopf and others (1981). Therefore, saline seeps would not likely form through the perching of shallow ground water because such seepage would require saturation of the upper several feet of material. It is doubtful that there [illegible] sufficient moisture available to effect such saturation, unless the [illegible] concentrated in a valley bottom.

[illegible] required by Montana's [illegible] mining rules to be [illegible] the [illegible], will [illegible] ground-water low or discharge area for the postmining water table. Under these circumstances, the spoil water levels would be drawn down below the surface in areas surrounding the stream course and the continual movement of ground water would lessen the potential for salts to accumulate. In addition, any salts accumulating near the surface from plant utilization of shallow ground water should be periodically flushed by soil moisture [illegible] down through the profile. The formation of saline seeps as a result of high spoil water tables can therefore be avoided through design considerations in the postmining topography.

The final situation envisioned where saline seeps could form following mining would be ground-water discharge points downgradient from, within, and adjacent to mining, creating the opportunity for evaporation of water and concentration of salts. In the postmining environment, a spoil aquifer will form at the base of the pit, and ground waters will move laterally (downgradient) to a discharge area. The primary ground-water flow into the spoil is expected to be lateral from adjacent unmined areas (not from vertical recharge). (See discussion under "Long-term potential degradation of water quality," petition paragraphs 26, 27, and 28). At present, the movement of ground water downgradient indicates that the postmining direction of ground-water flow would again be toward the Tongue River, where the opportunity for discharge occurs along coal or clinker outcrops. Saline seeps are primarily a result of evaporation and the concentration of salts. Thus, existing saline seeps in the area would be a good indication of the likelihood of postmining saline-seep development. The Soil Conservation Service soils maps for the petition area do not show any significant saline seeps for the petition area (Montana Department of State Land files on the Saline Seep Program, 1974-75). Therefore, the opportunity for saline-seep development at discharge points does not appear likely.

60

61 In summary, several scenarios of saline seep development as a result of mining have been considered, and the conclusions do not support the allegation that large-scale saline seeps will develop after mining.

62

EXHIBIT B

RATIONALE FOR BURLINGTON NORTHERN REVISIONS

1 PAGE 1, LINES 5-10.

The introduction was expanded to include the following: 1) the major sources of the information presented as in the vegetation and soils section, 2) a summary of the allegations, 3) a restatement of the important components of the current hydrology of the region, especially its variability, and 4) introductory rationale for the inclusion of modelling discussions.

2 PAGE 1, LINE 15.

The word "descriptive" in place of "unusual" would make the subheading more objective. (See the attached cover letter for a more complete discussion of this point).

3 PAGE 1, LINE 17.

Each time an allegation is quoted, a letter is assigned for organizational purposes.

4 PAGE 1, LINE 23.

This subheading was added to more closely identify where a regulatory response follows a petition allegation.

5 PAGE 1, LINES 32-35.

The point that surface water quality varies with location and season needs to be emphasized in the context of this paragraph (Knapton and Ferreira, 1980).

6 PAGE 1, LINE 39.

Climate is a major factor influencing water storage quantities and should be mentioned.

RATIONALE FOR BURLINGTON NORTHERN REVISIONS

7 PAGE 1, LINE 48.

Organizational clarity.

8 PAGE 1, LINE 48.

Reference to the allegation in paragraph 35 and page 12 of the petition, which is addressed here, was omitted elsewhere in the draft document.

9 PAGE 2, LINE 0.

Organizational clarity.

10 PAGE 2, LINE 10.

The word ~~mark~~ concept is more appropriate in this sentence.

11 PAGE 2, LINES 23 and 24.

What available literature contains conclusive evidence supporting this assumption?

12 PAGE 2, LINE 24.

This sentence has been revised to reflect the lack of conclusive post-mine data to support the statements made.

13 PAGE 2, LINES 26-29.

Since DSL and OSM have determined that only a small percentage of the petition area is clinker, it is not necessary to discuss a situation which is not applicable to the area. Therefore, these two sentences have been deleted to alleviate confusion.

RATIONALE FOR BURLINGTON NORTHERN REVISIONS

14,15 PAGE 2, LINES 30-32.

It is necessary to clarify the fact that the 2.7 percent here refers to 2.7 percent of the 20 percent which is clinker in the petition area. This translates to < 1 percent of the petition area as a whole.

16 PAGE 3, LINE 3.

This subheading was added to more clearly identify where a regulatory conclusion follows response to a petition allegation.

17 PAGE 3, LINE 13.

The focus of the primary issues raised in the allegations quoted below is the long-term effect of mining on water quality. ~~ecology, long-term effects on water quality~~. Therefore, a representative and objective single subheading is suggested.

18 PAGE 3, LINE 15.

Organizational clarity.

19 PAGE 3, LINE 32.

Organizational clarity. (See comment 17 above).

20 PAGE 3, LINE 34.

Organizational clarity.

21,22 PAGE 4, LINES 0-6.

The reader is not properly introduced to the definition of modelling, general concepts associated with it, and rationale for its use. Furthermore, a summary of the general assumptions used in the models presented is not clearly listed.

RATIONALE FOR BURLINGTON NORTHERN REVISIONS

23 PAGE 4, LINE 8.

Organizational clarity.

24 PAGE 4, LINES 8-29.

Since significant issues are addressed in the BLM analysis, it is important to present this analysis without risking possible error in interpretation. This is best accomplished by directly quoting the summary taken from Appendix C of the draft petition document. This analysis is also more representative for the BLM's hydrologic evaluation of the area, than just the Otter Creek evaluation alone.

25 PAGE 4, LINE 31.

Organizational clarity.

26 PAGE 4, LINE 40.

A range is compared to a mean in this sentence which leads to a lack of clarity. The appropriate range was substituted for the mean value.

27 PAGE 4, LINE 42.

The word "undesirable" was substituted for "unfit" to provide a more accurate description of the water quality addressed in this sentence, "It should be noted that waters used in the petition area can naturally exceed standards, but are used out of necessity (Table II-2, foot note 1).

28 PAGE 4, LINE 43.

The insertion of the word "however" would tie this sentence with the preceding sentence.

65

RATIONALE FOR BURLINGTON NORTHERN REVISIONS

29 PAGE 4, LINE 44.

This phrase was added to enhance the intended meaning of the sentence.

30 PAGE 4, LINE 48.

The use of the term degradation misrepresents Van Voast's work as included in Appendix D which is entitled "Theoretical Effects of Hypothetical Mine Spoils on Quality of Ground Water Along the Tongue River". The word degradation inferred in the document is not present in Van Voast's study and should be deleted. More accurate terminology is suggested.

31 PAGE 4, LINE 50.

A range is compared to a mean in this sentence which leads to a lack of clarity. The appropriate range was substitued for the mean value.

32 PAGE 5, LINE 7.

Organizational clarity.

33 PAGE 5, LINE 9 AND 10.

Deletion top of page 5. This sentence, as it appears, needs additional clarification in order to be meaningful. Without this clarification, this sentence should be eliminated.

34 PAGE 5, LINE 28.

Projections indicated in table IV-2 only show substantial increases for low flow (August-September) and not year-round as is implied the way the sentence is written. Therefore, the deletion of the word "substantially" is suggested to reflect the actual situation.

99

RATIONALE FOR BURLINGTON NORTHERN REVISIONS

35 PAGE 5, LINE 41.

The use of a double negative is confusing and should be changed as suggested to improve the sentence structure.

36 PAGE 5, LINES 47-50.

Lines 48 and 49 suggested for deletion, are repetitious. The sentence which follows with the substitution indicated, provides the same thought.

37 PAGE 6, LINES 8-38.

The concluding sentences have been deleted and a new subsection substituted. This subsection is entitled "Modelling Conclusions" and is suggested for the following purposes: 1) to point out the limitations in model comparisons, 2) to indicate the variability in results depending on inputs, and 3) to summarize generalizations apparent in all models presented.

38 PAGE 6, LINE 40.

A subtitle which is more objective is suggested.

39 PAGE 6, LINE 42.

The suggested revision provides clarity and objectivity (see comment 38 above). It also enhances the intended meaning.

40 PAGE 6, LINE 43.

The increased water consumption referred to here includes proposed uses, many of which are not currently operational. This sentence implies that all uses referred to in this sentence are currently in use.

41> [illegible]

42> PAGE 6, LINE 46.

Organizational clarity.

43> PAGE 6, LINE 46.

See comment 6.

44> PAGE 7, LINE 6.

The word "analyses" is more appropriate.

45> PAGE 7, LINE 6.

The suggested revision will maintain consistency with previous format changes.

46> PAGE 7, LINE 11.

This was added for sentence clarity.

47> PAGE 7, LINE 13.

This was added for sentence clarity (see comment 40).

48> PAGE 7, LINE 16.

The suggested word changes would be more accurate as used in this sentence.

RATIONALE FOR BURLINGTON NORTHERN REVISIONS

49 PAGE 7, LINE 18.

This is a re-emphasis of the point that the modelling scenarios discussed in the paragraph cannot be currently developed due to a lack of meaningful data.

50 PAGE 7, LINE 20.

Organizational clarity.

51 PAGE 7, LINE 34.

The suggested word change would be more accurate as used in this sentence.

52 PAGE 7, LINES 36 and 37.

The suggested revision will maintain consistency with previous format changes.

53 PAGE 7, LINE 46.

The term "watershed" is more technically correct as it is used in this sentence.

54 PAGE 8, LINES 20 and 21.

The revision suggested expands and further clarifies the concept expressed in this paragraph.

55 PAGE 8, LINE 23.

This is not an objective subheading and is responsive to the petitioner allegations quoted. Therefore, it is biased. Substitution of the word "and" for "failure" would make the subheading more objective.

RATIONALE FOR BURLINGTON NORTHERN REVISIONS

56 PAGE 8, LINE 25.

Organizational clarity.

57 PAGE 8, LINE 31.

Organizational clarity.

58 PAGE 10, LINE 3.

Organizational clarity.

59 PAGE 10, LINE 16.

Organizational clarity.

60 PAGE 12, LINE 0.

Organizational clarity.

61 PAGE 12, LINE 1.

Organizational clarity and consistency with format.

62 PAGE 12.

To enhance readability, it is suggested that all tables and figures be included at the end of the Hydrology section.

70

BURLINGTON NORTHERN

ENERGY AND MINERALS DEPARTMENT
COAL AND MINERALS DIVISION

First Montana Bank Center
175 North 27th Street
Billings, Montana 59101
Telephone (406) 657-8400

October 31, 1981

Ms. Sandi Johnson
State of Montana
Department of State Lands
Capitol Station
Helena, Montana 59620

Re: Tongue River, Montana Evaluation Document (draft) 82-4-228 SUMRA and 522 SMCRA Evaluation
DSL/DSM-PE-2
Public Hearing - Requested Information.

Dear Ms. Johnson:

On Wednesday, October 21, 1981, a joint hearing was held by the Montana Department of State Lands and the United States Department of the Interior Office of Surface Mining on the petition of the Northern Plains Resources Council, Tongue River Agricultural Protective Association, Tri-County Ranchers Association, and the Rosebud Protective Association to designate certain land along the Tongue River in Southeastern Montana as unsuitable for surface coal mining.

The spokeman for Burlington Northern, Intervenor, at that hearing was Mr. B. L. Ennis, President of Meridian Land and Mineral Company, a subsidiary of Burlington Northern, Inc. At the conclusion of Mr. Ennis' testimony, Mr. Melvin L. Shilling, Office of Surface Mining. Department of the Interior, Division of State and Federal Programs, asked Mr. Ennis if data related to the petition area could be made available to the hearing officers from Burlington Northern, within the appropriate time frame, in this matter.

Mr. Ennis replied affirmatively. (See transcript, pp. 38 and 39).

On October 30, 1981, I wrote to Mr. Mel Shilling of the Office of Surface Mining requesting until November 16, 1981 to make the requested information available. On October 31, 1981 I spoke with Mr. John North of the Department of State Lands regarding a similar extension. It was, and is, Burlington Northern's position that a time extension was acceptable because it would have been provided in order to supply information in support of testimony given at the hearing and was not new information as such.

I indicated to both Mr. Shilling and Mr. North that providing information before November 16 would be impossible for the reasons indicated in those letters.

Sometimes the impossible is overcome.

In order to avoid any conflict with the time limits imposed by the notice in the Federal Register, Burlington Northern submits the following comments and requests that the be treated as an addendum to our Comment letter dated October 14, 1981, submitted to yourself, Montana Department of State Lands,Capitol Station, Helena.

18 COMMENT 18: Present Marketability of Coal within the Petition Area - Basis for Decision - Section 522(a)(2).

a) Statutory History and Construction

It has been asserted by spokesmen for the Northern Plains Resources Council that the coal within the petition area is not now needed. In addition, it is asserted that the coal in the petition area is not competitive with that in other Powder River Basin coals. In particular, it was stated that given difficulties related to special reclamation requirements, the coal in the petition area is less competitive than Powder River Basin coals and hence, the petition area is not economically reclaimable. (See testimony of Art Hayes, Jr. speaking on behalf of the Northern Plains Resources Council, transcript pp. 10, 11, 12 and 13).

It is the position of Burlington Northern that this statement constitutes a misunderstanding of the economic feasibility of reclamation criteria of Section 522(a)(2) of the Surface Mine Control and Reclamation Act and its Montana counterpart. The question to be answered, properly stated is: Is reclamation, within the petition area, economically feasible?

Northern Plains seeks to construe Section 522(a)(2) to require that present marketability of coal be considered in determining unsuitability of the petition area for coal mining. The rational for this position seems to be that if the coal is not presently marketable, it cannot be sold and therefore funds will not be available for reclamation. This construction requiring present marketability of petition area coals is not to be read into the statute because this position cannot be found in language of the statute itself, nor is it to be found in the legislative history of the statute.

18 Your comments are noted.

The language of § 522(a)(2) provides as follows:

> Upon petition...the State regulatory authority shall designate an area as unsuitable for all or certain types of surface coal mining operations if the State regulatory authority determines that reclamation pursuant to the requirements of this Act is not technologically and economically feasible. (emphsis added)

The statute dictates that a petition area must be designated as unsuitable for all or certain types of coal mining operations if compliance with the reclamation obligations of the Act is not technologically and economically feasible.

The economic feasibility of reclamation criterion of § 522(a)(2) isolates the question of whether reclamation itself is economically feasible. We have conducted a thorough search of the legislative history of SMCRA, which is compiled in 10 volumes and some 2,000 pages collected in the Library of the Office of Surface Mining in Denver, Colorado. A computer search for references to "present marketability" of coal resources in the unsuitability designation process did not uncover a single such reference in the legislative history.

The legislative history of § 522 supports the plain reading of the statute that technological and economic feasibility of reclamation is the issue under § 522(a)(2) of SMCRA. As noted in the legislative history:

> It is the express interest of the committee that coal surface mining operations should not be conducted where reclamation (as required by this Act) is not feasible. The mining and reclamation requirements in S. 425 have been designed to accomplish this purpose. (empasis added)
>
> In addition to this general standard, the bill provides a vehicle for designating certain lands unsuitable for mining, under both Federal and State jurisdiction. Under this program States are authorized to designate as unsuitable for mining areas: (1) which economically or technologically cannot be reclaimed according to the requirements of the Act ... (Emphasis added.)

S. Rep. No. 93-402, 93rd Cong., 1st Sess. 46 (September 13, 1973)
Further on it was stated, regarding state programs:

> As a condition of having a State program approved by the Secretary of Interior, subsection (a) requires States to establish a planning process enabling decisions on the unsuitability of lands for all or any type of surface coal mining, but not for exploration

> Lands must be so designated if reclamation as required by this Act is not economically or physically possible. (Emphasis supplied.)

H. Rep. No. 28, 94th Cong., 1st Sess. 219 (March 5, 1975).

Similarly, the House and Senate Reports which accompanied the legislation eventually enacted as SMCRA support the proposition that the technological and economic feasibility of reclamation is the center of focus in § 522(a)(2). For example, the House report states:

> The committee wishes to emphasize that this section does not require the designation of areas as unsuitable for surface mining other than where it is demonstrated that reclamation of an area is not physically or economically feasible under the standars of the act. (Emphasis supplied.)

H. Rep. No. 95-218, 95th Cong., 1st Sess. 94 (April 12, 1977).

The "present marketability" of coal resources is suggested and required under SMCRA and the correlative Montana statute only by virtue of § 552(d) of SMCRA, which requires as follows:

> Prior to designating any land areas as unsuitable for surface coal mining operations, the regulatory authority shall prepare a detailed statement on (i) the potential coal resources of the area, (ii) the demand for coal resources, and (iii) the impact of such designation on the environment, the economy, and the supply of coal

As noted above, the legislative history contains no mention of "present marketability". It is reasonable, however, to interpret this section of the statute as requring that a decision maker understand the consequences of a decision of unsuitability.

This point was made that the Public Hearing by Steve Foster, attorney representing Montco, Wesco, and other intervenors. His testimony, taken from the transcript of the hearing, reads as follows:

> "...a statement should be prepared prior to any designation which deals with market supply and marketability, economics, and those kind of issues. I think it would be helpful to point out to the decision makers that these factors are not to be the basis of a decision. The agencies cannot determine that there is no market for Tongue River coal and thus declare the coal unsuitable for mining

> And by the same token, whether or not Tongue River coal can successfully compete in the market place again is not for an administrative agency.
>
> ...the statute says that prior to making any unsuitable designation, there has to be a statement which deals with the subjects. And the purpose of the statement I think is obvious. That is to provide to the decision maker a scenario for the consequences of an unsuitability designation and not to provide the basis of an unsuitability designation. Hence, it should be pointed out that the overall economic justification of mining is not an issue. What is an issue is whether or not reclamation is economically feasible. In this regard, present marketability of coal is not an issue." (Emphasis supplied.)

b) Conclusion.

Chapter III is necessary component of the draft evaluation document, but cannot be the basis upon which a decision is reached, for its purpose is, in Mr. Foster's words, "...to provide to the decision maker a scenario for the consequences of an unsuitability designation..."

75

19 COMMENT 19: Present Marketability of Coal within the Petition Area - Consequences to Montana of an Unsuitability Designation - Section 522(d).

Considerations of present marketability of coal within the petition area do possess an appropriate place with the unsuitability designation process.

Pursuant to Sections 522(a)(2) and 522(d), the Department of State Lands of Montana ("DSL") and the Office of Surface Mining ("DSM") have prepared a draft Tongue River, Montana, Petition Evaluation Document (September 1981). Chapter III of that document covers the evaluation of coal resources and supply and demand for coal. That chapter addresses the questions of the coal geology, potential coal resources, the demand for coal, and the impact of a designation of unsuitability on the economy and coal supply of the petitiion area. In particular, the chapter presents an economic analysis conducted by comparing coal from the petition area with other coal available to meet national coal demand in the year 1995. The thrust of that economic analysis results in a finding of the national cost of meeting the coal demand if the petition area were removed from production.

19 Please see revisions to text under "Social, Economic, and Community Services Background" (from chapter II of the draft document) in chapter II.

The draft decision document section prepared pursuant to [illegible] may result in present market resources lost if the petition area is designated as unsuitable for surface coal mining operations.

In this regard, the focus of the draft decision document at p-III-1[illegible], is primarily upon national [illegible] granting the petition and could be improved.

Given the fact that the hearing was completed jointly by the State of Montana and the United States, as was preparation of the draft decision documents, additional information should be included to address the effect of granting the petition on the Montana economy.

At the hearing, Mr. O'Connor stated that if the petition area was designated as unsuitable, it "would have the effect of depriving the State of Montana of some $15 billion in revenues under the severence tax laws and under the gross proceeds tax". (Transcript p. 63.)

Burlington Northern suggests inclusion of the following language as a new last paragraph on page III-13:

> "The cost to the treasury of the State of Montana, in severence tax and gross proceeds tax, if the petition area were removed from production, would be approximately $15 billion."

COMMENT 20: Future Marketability of Coal within the Petition Area - Section 522(d).

20a a) Draft Decision Document Statement of National Demand

As noted at page III-13:

> "The Colorado Energy Research Institute (Sebesta, 1980) projects that the total demand for Montana coal between 1979 and 1986 should increase by 58 percent to approximately 51.4 million tons. By 1991, a 31-percent additional increase is expected, to a total demand of 67.2 million tons. Most coal production in Montana comes from the Powder River Basin and is used by electric utilities." (Emphasis added.)

Conclusion:

Burlington Northern submits that the petition area is within the Powder River Basin. Thus, by 1991, petition area coals could provide a share of this additional demand for 15.8 billion tons of coal. There is demand for petition area coals.

20a There is potential demand for petition-area coals under the current limited leasing policy, as indicated in chapter III of the draft document.

20b

20b Your comment is noted.

20c

20c Your comment is noted.

20d

20d Thank you for these reports.

Within the coming week, as our move is completed, we will further submit the following additional materials:

3. Steam Electric Plant Factors (National Coal Association).

4. 1980 Annual Elect Power Survey, a Report of the Electric Power Survey Commission of Edison Electric Institute.

20e e) Specific Comments

20e Your inclusion is noted.

Burlington Northern suggests inclusion of all of the following language after the last paragraph on p. III-15:

* * * * * * * * * *

"Supply and Demand for Petition Area Coals - Published Information.

Published information discloses three components of a market for petition area coals, each oriented toward the generation of electricity. They are: (1) future electric generating plants in the Western United States that are within economic reach of the petition area by overland railroad transporation, (2) selected future electric generating plants near the Great Lakes in the mid-western and eastern United States that are within economic reach of the peition area through a combination of railroad transporation and a Great Lakes docking facility followed by water transport to the area of final destination, and (3) Pacific Rim foreign electric generating plants in the Far East that would be reached by rail transport from the petiton area to the western coast of the United States and then ocean transport to the county of final destination.

CATEGORY I - Western U. S. Plants:

The National Coal Association has recently forecast (1) that coal consumption for electric generation in the far western United States would grow from a 1979 base of 100 million tons to 178 million tons.

Comprehensive lists (2,3,4) of plants formally declared to be built in the future, discloses that the market potention for the petition area coals from these Category I plants is at least 20-30 million tons.

CATEGORY II - Mid-Western and Eastern U. S. Plants:

The easternmost point of Montana coal movement on the Great Lakes will possibly be Lake Erie under existing transporation conditions. That conclusion is based upon the limitation of vessel size through the Welland Canal precluding the use of large self-unloading vessels to move to Lake Ontario and ports beyond. However, the movement

of Montana coal onto the Lakes could open up the coal market to several proposed electric generating plants in New York, Michigan and Ohio. It is estimated a market potential for the petition area coals from these Category II plants of at 5-8 million tons.

CATEGORY III - Pacific Rim Export.

A strong growth market for U. S. Steam coal has developed in the export market. Because of their immediate competitive value, definitive market studies on these overseas consumers of coal are closely held at the present time. However, the National Coal Association forecoast previously referred to (1) shows the coal imports of Japan, South Korea, Taiwan and Other Far Eastern Markets growing from a 1979 base of 74 million tons to a 1990 level of 153-180 million tons, with most of the growth coming in steam coal imports (as differentiated from metallurgical coal imports).

Many different coal producting areas, both within the United States and from foreign countries, will be involved in fulfilling this expanding market. A potential market from Category III, in which the petition area coal can compete, could consist of at least 5 - 10 million tons.

Besides the National Coal Association study, there is an additional source of information regarding the potential of this market.

At hearings in March of 1981 before the Montana Legislative House Committee on Natural Resources, the Montana International Trade Commission testified in support of the repeal of Section 77-3-315, M.C.A.(2)

Section 77-3-315 then under consideration, states as follows:

> "Any corporation, individual, or person who contacts the sale of coal from such leased lands to any individual, corporation, or person foreign to the United States, except those countries contiguous to the United States, shall have the lease terminated."

In urging the repeal of this section, the Montana International Trade Commission focused its attention upon the foreign markets which could be made available for Montana coal but which were unavailable due to the enactment of this statute.

Specifically, it was pointed out that its investigation then indicated that a one hundred million steam coal market would be available by 1990 in Japan, Taiwan, and Korea by 1990. Up to 25% of the steam coal market in these countries could be supplied by U. S. coal producers. The Montana International Trade Commission computes total demand for Montana coal to be between 6.25 and 8.3 million tons per year. Their research further indicated that Montana

[illegible]

[illegible]

The following table shows a [illegible] estimate of total potential market within which the petition area [illegible] participate.

POTENTIAL MARKET
(Million Tons Per Year)

[illegible] I -	Western U. S. Plants	[illegible]
[illegible] II	Mid-Western and Eastern Plants	[illegible] - 8
[illegible] III -	Pacific [illegible]	[illegible]
	TOTAL	[illegible]

REFERENCES

1. A Forecast For U. S. Coal In the 1980's (National Coal Association, 1981)

2. Electric Power Supply and Demand 1981-1990 (National Electric Reliability Council, July, 1981)

3. Stream Electric Plant Factors (National Coal Association).

4. 1980 Annual Electric Power Survey - Report of the Electric Power Survey Commission of Edison Electric Institute.

5. Testimony before Montana House Committee on Natural Resources (Montana International Trade Commission March 1981 - copies available upon request).

* * * * * * * * * * *

As I mentioned in my letter to you of October 15, 1981, Burlington Northern invites careful scrutiny of these comments.

Very truly yours,

Thomas E. Root

Thomas E. Root
Project Manager
(406) 657-8368

cc: Mr. John North - DSL - Helena
Mr. Mel Shilling - OSM - Denver

MERIDIAN LAND AND MINERAL COMPANY
BURLINGTON NORTHERN

800 First Northwestern Bank Center
175 North 27th Street
Billings, Montana 59101

November 3, 1981

Ms. Sandi Johnson
State of Montana
Department of State Lands
Capitol Station
Helena, Montana 596[illegible]

Re: Comments--Tongue River, Montana
Petition

Dear Ms. Johnson

In conformity with my letter to you of October 31, 1981, kindly find the following document enclosed with this letter:

1 1. Steam Electric Plant Factors, 1978 (National Coal Association)

As the other requested information comes available, I will forward it to you.

Very truly yours,

Thomas E. Foot

TER:[illegible]
enclosure

1 Thank you for the report.

18

Central and South West Fuels, Inc.
[illegible] • [illegible] • [illegible]

October 27, 1981

Ms. Sandi Johnson
Montana Department of State Lands
1625 Eleventh Ave.
Helena, MT 596[illegible]

Dear Ms. Johnson:

I have reviewed the Petition to designate certain lands unsuitable for mining and the affidavits enclosed. I have also reviewed the Toung River Montana Petition Evaluation Document, Draft.

I would recommend that the area receive a designation that none of the petition area is unsuitable for surface coal mining operations. The information contained in the petition and draft identified some potential problems with mining in the area but solutions were outlined in the draft report. 1

The designation chosen will not guarantee mining will occur. The resource must address the problems outlined in the petition as well as the usual permitting requirements.

Very truly yours,

Kim Forster

KF:jh

1 Your comment is noted.

A Member of the Central and South West System
Central Power and Light Corpus Christi, Texas | Public Service Company of Oklahoma Tulsa, Oklahoma | Southwestern Electric Power Shreveport, Louisiana | West Texas Utilities Abilene, Texas

Daniel P. Baker
Manager - Government Affairs
Western Area

Consolidation Coal Company
Government Affairs
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

October 19, 1981

Sandi Johnson
Montana Department of State Lands
Station
Helena, Montana 59620

Reference is made to the petition the Northern Plains Resource Council filed with the Montana Department of State Lands and the Office of Surface Mining, Reclamation and Enforcement on December 29, 1981 in which the petitioner requested that certain lands along the Tongue River in Montana be declared unsuitable for surface coal mining. Reference is also made to the draft document entitled "Tongue River, Montana Petition Evaluation Document" dated September, 1981 which was prepared by DSL and OSM in co-operation with the U.S. Geological Survey and the Montana Bureau of Mines and Geology. Consolidation Coal Company understands that final decisions on the petition by the regulatory authorities are anticipated in December, 1981. We offer the following comments for your consideration.

The area referenced in this petition for unsuitabiltiy designation is excessively large - almost 200,000 acres. We can appreciate the tremendous burden this places on DSL and OSM and feel that it was not the intent of public law 95-87 that such enormous acreages be considered in the petition process.

1 As the petition evaluation document pointed out, Section 522(a)(2) of the Surface Mining Control and Reclamation Act (PL95-87) and Section 82-4-228(2) of the Montana Strip and Underground Mine Reclamation Act both require the regulatory authority to declare an area unsuitable for all or certain types of surface coal mining activities if it finds that reclamation is not technologically and economically feasible. In a large coal field such as the area covered by this petition, Consolidation Coal Company feels that these decisions can best be made when surface mining permit applications and the accompaning site-specific environmental data are submitted to the regulatory agency. Any designation of unsuitability should be made on the basis of adequate site-specific data. Consolidation Coal Company feels that the State of Montana already has an adequate system of application review which will prevent the issuance of a surface mining permit if an area cannot be properly reclaimed and necessary environmental safeguards instituted during the mining operation.

2 For the purpose of predicting water quality changes that may be caused by surface coal mining operations, Consolidation Coal Company notices that the regulatory agencies have assumed worst - case conditions and that water quality impacts of all anticipated mining would occur at the same time.

1 Your comment is noted. While it is true that in many instances site-specific data are needed, it is the intent that the Designation of Lands Unsuitable for Mining process be used as a planning tool on an area-wide basis.

2

3

Sincerely,

Daniel P. Baker
Manager - Government Affairs
Western Area

DB/bt

cc: John Lovell, Branch of Environmental Analysis
Office of Surface Mining, Reclamation and Enforcement
Department of the Interior
1951 Constitution Avenue N.W.
Washington, D.C. 20240

2

3

PEABODY COAL COMPANY
ROCKY MOUNTAIN DIVISION
CAMPUS 6 OFFICE SUITE 600 12015 EAST 46TH AVENUE
DENVER COLORADO 80239
(303) 371 7990

October 30, 1981

Ms. Sandi Johnson
Montana Department of State Lands
Capitol Station
Helena, Montana 59620

Mr. [illegible]
Branch of Environmental Analysis
Office of Surface Mining
Reclamation and Enforcement
Department of the Interior
1951 Constitution Avenue, N.W.
Washington, D.C. 20240

RE: Northern Plains Resource Council
Unsuitability Petition - Tongue River

Dear Ms. Johnson and Mr. [illegible]:

This written comment is submitted as a follow up to the oral testimony presented by Peabody Coal Company at the public hearing which was held by your offices on October [illegible], 1981 in Ashland, Montana relating to the Tongue River Unsuitability Petition.

Because of stringent time constraints imposed by your offices, I was unable to orally present a number of points which Peabody felt was important to orally submit and was further [illegible] required to [illegible] abbreviate and condense various [illegible]

1 For example, [illegible]

2 [illegible]

1 The transporta[illegible] expor[illegible] with the Department of Energy's [illegible] the model does not allocate coal for export from [illegible] the petition area [illegible] that are exported [illegible]

2 [illegible]

In addition, there were a number of legal points which we felt were of sufficient significance as to justify an oral explanation to the panel and to the audience. For example, we think there is a substantial legal question as to whether the Office of Surface Mining has jurisdiction to review and decide on a petition of this nature or whether OSM's unsuitability powers are restricted under the Surface Mining Control and Reclamation Act of 1977 to the overall federal lands review, as specified in Section 522(b), or to petitions under a federal program for a State. We construe Section 522(a)(2) and 522(c) as limiting the jurisdiction of petitions in a state with an approved state program to consideration solely by the state regulatory authority. 3

These and other arguments we felt should have been raised orally at the Ashland hearings on October 21 and 22. However, because of the artificial ten minute limit which was placed upon us and which was stringently enforced against Peabody, we were unable to raise these and other arguments in a public forum. As a result, we feel it is necessary to submit this letter by taking exception to the ten minute oral argument limit on the grounds that we have not been accorded due process of law as required in the Montana and the United States Constitutions. 4

All other comments and materials previously submitted by Peabody either in its Intervention Petition or orally at the October 21 hearing are incorporated herein by reference.

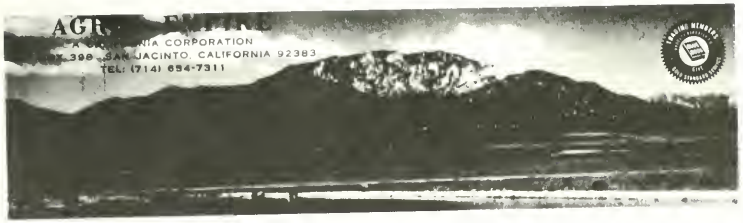
Sincerely,

Terry L. O'Connor, Director
Legal and Governmental Affairs

TLO/sj

3 Legal questions such as this are beyond the scope of this analysis. Your comment is noted.

4 Peabody did not object to the 10-minute time limitation or request an extension prior to the hearing. The comment period did not close until November 2, 1981, 11 days after the hearing. Any matter submitted by Peabody within the comment period has received the same consideration as it would have received had it been orally submitted at the hearing.



October 23, 1981

Sandi Johnson
Montana Dept. of State Land
Capitol Station
Helena, Montana 5962[illegible]

Dear Ms. Johnson

Re: Tongue River Valley

By way of introduction, Agri-Empire Corporation is a family owned farming company. We own and operate some 300,000 acres of farm and grazing land in a number of western states. I have enclosed a letter of introduction from my bank.

We also own several ranches in Montana. My daughter, son-in-law and grandchildren have lived and ranched in Montana for ten years.

1 At the present time, our company is developing several thousand acres of irrigated farm land on an 18,000 acre ranch we own in the Tongue River Valley some 60 miles south of Miles City. The land has water rights from the Tongue River. In over 40 years of farming many types of row crops I have never seen richer or more productive soil than on this ranch.

Our company presently ships many fruits and vegetables from our operations in California and Arizona to Montana that could be produced close to Montana's major markets. The freight alone on many of Montana's imported commodities from California and Arizona is often more than the commodity sells for at point of origin. This would reflect a substantial savings to the consumer in Montana and still allow our company a reasonable profit.

As you know, the American farmer is the most efficient

1 Your comment is noted.

SECURITY PACIFIC NATIONAL BANK

[redacted]
Vice President Manager

July 31, 1981

To Whom It May Concern:

This letter will introduce Mr. James Minor, President and principal stockholder of Agri-Empire Corporation.

Agri-Empire is the largest potato grower-packer-shipper in the western United States. In addition, the company engages in cattle raising operations, maintaining a number of premier cattle ranches in California, Montana, Utah, and Oregon.

We have been favored with the commercial accounts of the company since 1943, with depository balances currently averaging in excess of ten million dollars. We have provided unsecured credit peaking in a moderate eight figure proportion with a medium seven amount presently outstanding. The credit accomodation is one of the largest unsecured borrowing relationships administered by the Banking Office System of this Bank.

All banking relations have been maintained in an excellent manner, and we hold the company and its management in highest regards.

Mr. Minor serves as member of the Inland Empire Advisory Board for Security Pacific National Bank. Any courtesy which may be afforded him would be sincerely appreciated by the Bank.

Sincerely,

Charles E. Elliott, Jr.
Vice President and Manager

CE/mb

Montana Dept. of State Lands

We own coal in the Otter Creek Area and would presently having the right to to have it developed as we see fit. We resent people, especially those who do not live in our area, trying to dictate what we should do with our coal.

1 The mining of coal couldnot harm this community. We would benefit in many ways. By having better roads developed, more money for schools, creating good employment, and bringing in many services that we now travel many miles to obtain.

The mining regulations would take care of reclaiming the small amount of acreage involved.

Good coal is in demand and we feel that is what we have.

Jerry Bell Allen Naomi Thompson by JBA
Howard A Allen

1 Your comment is noted.

Tongue River State
Miles City, Montana
October 29, 1971

Montana Department of State Lands
Capitol Station
Helena, Montana

Dear Sir:

I think that the land in the Tongue River petition area should be declared unsuitable for mining at this time. The coal is not and will not be needed for some time and maybe never. It is highly probable that before it is needed it will be obsolete to more efficient, cheaper and better ways of producing energy. The effects of mines and reclamation already being done have just begun to show. Springs and the water table in this area have dropped lower in the last few years than ever before, including the thirties. With all of the dykes and still water dams put in in the last 40 years, springs shouldbe better and the water table higher.

Part of the land I own was transferred from the government to the Horton brothers, who filed water rights on it in January of 1907. My grandfather, who worked for a few years traded his homestead for it over 60 years ago. This land is good grass and far land but half of the irrigated land some of the pasture is already to the salt limit, and if the river water and springs become salty from upstream mining it would be unusable for anything. The mining would last for a limited number of years but if the land in the Tongue River Valley which is capable of raising lots of food, grain, hay, and cattle is ruined till the end of time the results would not be worth living, the pockets of a few coal and connected businesses, where the public would be better served the way it is now used.

The proposed Tongue River Railroad, as now planned, cuts through the best most productive and valuable land from one end to the other. It will ruin all of the natural and developed flood bottoms along it cutting the production from nothing to half, and dividing the hay land from the winter pastures and water, reducing the value of the land and doubling the cost of operating a ranch.

The 5.5 billion ton of coal in this area is stored in the best possible place where it is now. If in the future it proves to be needed and a way found to move it without destroying the entire valley below, it will still be there.

Sincerely,

Richard J. Anderson
Richard J. Anderson

1 Your comment is noted.

91

Testimony Presented by Charles Andrews
October 22, 1981 in Ashland, Montana

My name is Dr. Charles Andrews
I reside in San Francisco at 1[illegible] Incline St.
I am speaking today on behalf of the Northern Plains Resource Council.

Though I now reside far from Tongue River County, I previously resided in Lame Deer and I spent two years studying the hydrology of the Tongue River system.

Some of the results of my studies on Tongue River are contained in the two papers I co-authored:

> The Impacts of Coal Strip-Mining on the Hydrogeologic System of the Northern Great Plains: Case study of the potential impacts on the Northern Cheyenne Reservation. Journal of Hydrology, 1979, by B. Woessner, C. Andrews and T. Osborne.
>
> Sediment characteristics of Tongue River Basin by T. Osborne and C. Andrews, ASCE Watershed Management Symposium, 1980.

On April 10, 1981, I submitted an affadavit on behalf of the Northern Plains Resource Council which presents a concise statement of my thoughts on long term changes that will occur in the hydrology of the Tongue River Basin and as a result of extensive coal strip mining in the basin.

In my affadavit I made five major points:

1) Tongue River in the petition area has better water quality than any other major stream in the coal bearing region of the Powder River Basin.

2) Water quality in the Tongue River will be degraded by coal strip mining in the basin. TDS concentrations will increase and sediment loads will increase.

3) Water quality in the Tongue River alluvium and in the shallow aquifers in the Tongue River member will be degraded by coal strip mining; that is, TDS concentrations will increase.

4) Saline seeps are likely to occur in reclaimed spoils areas that are hummocky and where revegetation has not been very successful.

5) That I and others didn't know the extent of water quality and land quality degradation that would occur as a result of extensive coal strip mining in the Tongue River Basin and thought it appropriate that these issues be addressed through the petitioning process. Though not stated in the affadavit, I have long been an advocate of quantitative cumulative hydrologic impacts in the Tongue River Basin. I have testified at several coal mining permit hearings to this effect. Previously, the response from state and

federal agencies was that they were "working on it...". Well their report came out, the Northern Powder River EIS, and, unfortunately, cumulative hydrologic impacts are very poorly treated. Therefore, the need to quantify these impacts through this petition process.

OSM and DSL responded to the first four points I listed in the petition document above and I will now provide a critique of their responses.

The petition document acknowledges the unusual hydrology of the petition area. The document, though, downplays the significance of the low suspended solids loads in the Tongue River above Brandenburg. The petition document attributes these low loads to the trapping efficiency of the Tongue River dam. This argument is overplayed and not relevant, the trapping efficiency of the reservoir is low, and the sediment loads in the river above the reservoir are low as detailed in my paper on sediment characteristics of the Tongue River Basin. Sediment yields are very low in the petition area relative to other areas in the Powder River Basin because of the unusual basin characteristics in the area, and as a result, sediment loads in the river are low.

1

The petition document acknowledges that saline seeps may occur, but states that large-scale saline seeps will not develop after mining. I concur, if and only if, revegetation is successful.

2

The petition document also acknolwedges that alluvial and shallow ground waters downgradient of the mined areas will be degraded. The petition document states that mining in the Otter Creek Basin will increase TDS concentration in the alluvium from 1650 to 4700 mg/l and that mining in the Tongue

3

Although the natural suspended sediment load above the reservoir is low, the reservoir does impound high-runoff events that carry high suspended sediment loads. For these types of events, the reservoir does act as a trap. Although the overall trap efficiency of the reservoir may or may not be low, it still moderates streamflow and causes mixing of dissolved constituents, which generally results in a reduction in range of concentrations of many constituents (Knapton and McKinley, 1977). We do not believe that the Tongue River Reservoir actually lowers the TDS levels due to limited retention times; rather, the reservoir retains the high flows for later release, and, thus, high TDS levels from tributary streams are diluted as they enter the Tongue River throughout the year. DSL/OSM have no data on the basis of which to judge unusual basin characteristics.

1

There are data available which indicate revegetation on existing mined areas appears promising (Dollhopf and others, 1980; Howard and Regele, 1981; Depruit and others, 1980). However, revegetation failure would have consequences beyond that of saline seep development. It is, of course, one of the key criteria for reclamation from the standpoint of landscape stability, prevention of accelerated erosion, and a productive postmining land use. There is not sufficient evidence on the petition area to conclude that revegetation efforts will fail due to inadequate soil materials.

2

The noted increase from 1,650 mg/L to 4,700 mg/L does not necessarily preclude the use of the ground water for stockwater. Table V-3 of the Water Quality Criteria of 1972 (U.S. Environmental Protection Agency, 1973, p. 308) states that water in the range of 3,000 to 4,999 mg/L is satisfactory for livestock but may cause diarrhea or be refused at first by animals not accustomed to it. Due to the complexities of the alluvial aquifers, it is likely that water of both better and worse quality than the predicted values will occur within the petition area. To determine which areas of the alluvial aquifer may be degraded to the point that the essential hydrologic function would not be maintained requires site-specific data such as that submitted with a mine plan. Please see the revisions in chapter II.

3

River valley will increase TDS concentrations in the river alluvium 200 to 250%. The increase in TDS in the Otter Creek alluvium will render the alluvial ground waters unfit for livestock use. It can be argued that the essential hydrologic function of the alluvial aquifers will not be maintained if water quality changes of this magnitude occur, and that subirrigaion efficiency may be impaired.

The most serious hydrologic allegation in the petition is that long term changes will occur in water quality in the Tongue River. The petition document acknowledges that changes will occur in water quality, but I believe that the model used to calculate these changes is inappropriate for the system being studied and therefore that the calculated results are meaningless. A similar comment was made last evening by Bob Stiles of MONTCO.

95

I believe that the model is inappropriate for the following 4 reasons:

1) Dissolved solids concentrations of spoils leachate are incorrectly calculated. In the model used, the TDS concentrations in spoils are calculated by applying a coefficient of 1.5 to the mean dissolved-solids concentration of water samples from wells or springs. The coefficent is derived from the literature based on research outside of the petition area. In Appendix D of the petition document, calculation based on overburden saturated paste extracts from the petition area suggest that a factor of 2.5 to 3 would be more appropriate. Studies by Woessner and others (1979) on the Northern Cheyenne Reservation suggest that a factor of 3.5 to 4 would be appropriate for calculating spoils water quality from pre-mining water quality.

4

DSL and OSM believe that the USGS water-quality model is the best predictive model available for the Tongue River. Validation of the model indicates that half the simulated months fell within their historic 95-percent confidence interval, five months exceeded the upper limit of their confidence interval, and one month fell below the lower limit of its confidence interval (Woods, 1981).

4

DSL and OSM disagree that the dissolved-solids concentrations of spoils was not correctly calculated. As noted in the comment, several coefficients could possibly be used in the calculation of dissolved-solids concentrations. The coefficient used represents an average of coefficients (Woods, 1981). Please see responses to the Woessner letter.

[illegible] from spoils are incorrectly calculated in the model. A technique developed by McWhorter and others (1979) was used to calculate loadings. This technique was developed from research outside of the Powder River Basin in Northern Colorado and assumes that all ground-water moving through the spoils originates as recharge to the spoils. This will definitely not be the case in the Tongue River valley. Much of the water entering the spoils will come from upgradient, unmined coal seams. More appropriate techniques for calculating loading are those used by Van Voast in Appendix D of the petition documents, by Woessner, Andrews, and Osborne (1979) and by MONTCO in their permit application.

5

I also disagree with the run-off coefficients used, but I withhold comment as I think the whole technique should be scrapped. When the loading technique is changed, the effect of various recharge rates through the spoils should be investigated. Research on recharge through spoils has been sketchy, with most research tending to confirm the ususal assumption that pre-mining and post-mining recharge rates will be similar. Detailed research by Groenwald and others (1979), though, has shown that because of differential settling and piping in spoils with textural characteristics similar to these in the petition area long term recharge rates through spoils may be higher than pre-mining rates and therefore higher loadings will occur.

6

3) The model only considers surface water quality changes due to water quality changes in ground water. Water quality changes will also occur by surface water run-off from the mined areas. I acknowledge

5

DSL and OSM believe the method used for calculating salt loading is correct in the USGS model. When compared with loads calculated by aquifer characteristics and the model's equation, the results differed by only 167.7 tons/year. Also, regarding recharge and loading, it is true that increased recharge would somewhat increase loading. The petition alleges that recharge would be decreased, your comment assumes it would be increased, and our evaluation concludes it would experience no significant change for the reasons stated on page IV-3 and IV-4 of the draft document. Please see responses to the Woessner letter.

6

Please refer to pages IV-20 and IV-21 of the draft document.

that research on this topic is sketchy, but the effects must be considered. Refer to affadavit.

4) The model is overly complex for the problem at hand. (I was asked to elaborate on this point at the hearing, but after giving the matter careful thought, I think that this point should be ignored. The model is very complex, and simpler models would have been sufficient for this problem, but the present model does correctly calculate TDS change for given salt loadings.)

7

7 Oral communication with Andrews indicated a simpler model could not be suggested because one was not known to exist (November 1981).

In conclusion on this point, when deficiencies in the model are corrected, and when extensive coal mining is considered, significantly larger water quality charges in the Tongue River will be calculated than are shown in the petition document.

97

Several speakers have stated that a deficiency in the model is the non-treatment of the sequential nature of mining. I disagree. Water quality changes will appear slowly in the Tongue River for decades after mining occurs, but the changes will persist for thousands of years. Therefore, sequencing over a period of a few decades is not important. In addition, early work by Van Voast and others had suggested that maximum water-quality changes only occured when the first pore volume of water moved through spoils. Subsequent research has suggested that where direct recharge occurs through spoils, alternate wetting and drying at a recharge front can produce very poor quality water for long periods of time.

Several miscellaneous points:

1) all calculations in report based on overburden data should be redone in light of 30 OSM overburden holes;

8

8 DSL and OSM have recalculated both the work by Van Voast and by Woods in light of the DSL/OSM drilling program. We have also expanded the analysis of cumulative impacts with the results indicated in chapter II of this document.

2) there should be more in-depth analysis of cumulative impacts of upstream development, and analysis of cumulative impacts in the Decker area;

9 3) changes in productivity on subirrigated lands due to changes in ground-water quality in alluvial valleys should be calculated; and

10 4) changes in productivity or changes in needed water diversions due to Tongue River water quality changes should be calculated.

11 In conclusion, OSM/DSC have made a good attempt at quantifying cumulative impacts. Unfortunately, though, parts of the analysis are flawed. These flaws must be corrected so that an adequate evaluation of the hydrologic allegations of the petition can be made. Several speakers have stated that analyses should only be made after site specific studies are made. This argument should be ignored. In my opinion, sufficient data are available, and hydrologic processes are sufficently understood to make scientifically sound conclusions on long term hydrologic changes on a macroscale in the Tongue River valley. State and federal agencies and consultants are always trying to impress one of the need for more and more data. Infrequently is the new information obtained from additional data ascertained--frequently the amount of new information is very little. Results of the calculations of these long term hydrologic studies should not, though be calculated deterministically as has been done. Stochastic models should be used that incorporate uncertainty in the understanding of processes and input parameters. Only then are sound scientific conclusions made, and only then is there adequate information for decision making.

9 The productivity of alluvial valley floors is protected under the State and Federal acts (SMCRA, Section 510(b)(5)(B), and SLMRA, Section 227(3)(b)(i)).

10 Changes in actual productivity have not been projected. However, it can be assumed that as the quality of irrigation water decreases, and quantity remains constant, production will decrease relative to the soils present, methods of irrigation, crop sensitivity, and cations present.

11 DSL and OSM disagree that the comments noted represent fatal flaws with the USGS water-quality model used in the petition evaluation. Please see responses 4, 5, and 6 to this letter.

86

11 Tongue River valley from the dam to near Brandenburg is an unusual environment that should be protected from the potential impacts of extensive coal strip mining. Many other areas in the Powder River Basin contain coal deposits that are as economical to mine as those in the Tongue River, but which can be mined with much less environmental damage without jeopardizing the agricultural productivity of a river basin.

References

McWhorter, D., J. Rowe, N. Van Liew, R. Chandler, R. Skogerboe, D. Sunada, G. Skogerboe, 1979, Subsurface and surface water quality hydrology in surface mineral watersheds: EPA-600/7-79-1930, 193 p.

Osborne, T., and C. Andrews, 1980, Sediment characteristics of the Tongue River Basin: American Society of Civil Engineer's Watershed Management Symposium, Boise, Idaho, Published by ASCE, 345E., 47th St., New York, N.Y. 10017.

Woessner, W., C. Andrews, T. Osborne, 1979, The impacts of coal strip-mining on the hydrologic system of the Northern Great Plains: case study of the potential impacts on the Northern Cheyenne Reservation, Journal of Hydrology, 43:445-467.

October 30, 1981

Sandi Johnson
Montana Department of State Lands
Capitol Station
Helena, Mt. 59620

RE: Tongue River, Montana
Petition Evaluation Document

Dear Ms. Johnson:

I have reviewed the Hydrology section of the Draft Tongue River, Montana, Petition Document (State of Montana and U.S. Department of Interior, September 1981). In general, I concur with the projections of decreases in ground water and surface water quality in terms of TDS and as a result of projected mine development as described in the document, pages IV - 6 through IV - 16 and page V - 3.

1 Water quality projections described in the document do not take into account any increased municipal or industrial (other than mining) water use, which, in my view would likely accompany increased coal development. Such developments may have a significant effect on water quality and quantity.

2 Water quality projections do not consider individual dissolved elements. Can certain ion species be expected to increase to toxic levels in certain shallow aquifers?

3 In many instances, the projected reduction in water quality, as a result of not designating the petition area as unsuitable for mining, would result in much water being unsuitable for its present use. Good water is a precious substance in the Tongue River Valley. As such, many farming and ranching operations currently put it to its best possible use, in many cases irrigating and watering livestock with water whose quality is only barely adequate for those purposes.

4 Decreases in water quality of the magnitudes projected in the document would have a profound effect on farming and ranching in the area. In many cases, alternate sources of water may not be economically available, and much agriculture and grazing would cease to exist.

Tom Bateridge, Hydrologist
Geoservices West
Missoula, Montana

1 In the final document, DSL and OSM did take into account increased industrial withdrawals for the analysis of cumulative impacts. Please refer to chapter II for these results.

2 Generally, postmining hydrologic systems will contain higher levels of both common and trace elements than will the premining system. However, given the current level of data in the petition area, it was not possible to project the levels of individual types of ions in postmining systems.

3 DSL and OSM agree that good water is vital to the farm and ranch operations in and downstream of the petition area. Keeping in mind that the actual impacts of decreased water quality are highly dependent on the use itself, methods of use, and cations present, we have refined our earlier projections for postmining water quality. Please refer to chapter II.

4 In some areas, alternative sources of water may not be economical for the individual rancher/farmer; however, where mining is shown to result in the loss of a suitable water supply, the mining company must provide a suitable alternate source for the affected operation.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] the [illegible] of mineral rights in the area of dispute covered by the Northern Plains Resource Council petition. I have read with extreme interest the in-depth studies set forth in the TONGUE RIVER, MONTANA PETITION EVALUATION DOCUMENT DRAFT issued through the Department of State Lands and the Office of Surface Mining. The following are some of my thoughts, questions and conclusions.

It is evident to me that all the State and Federal Agencies have answered the allegations of the NPRC et al petition and have thoroughly refuted each and every allegation by extensive and exhaustive research. The publication COAL WEEKLY, Vol. 7 No. 40 of October 5, 1981 has stated the results succinctly, and I quote "Northern Plains Resource Council is wrong in claiming land along the Tongue River couldn't be reclaimed after coal mining, and mining won't damage the water supply, says a draft evaluation by state and federal agencies of NPRC's unsuitability petition".

1 There are serious constitutional questions posed by NPRC et al, in their efforts to block mining of coal in this area, especially where the land surface and minerals are owned in fee. Do organizations such as NPRC et al, have the legal right to deny just compensation to the owners of the surface and minerals without due process of law?

2 Why do the NPRC et al, say that this coal is not vital to the energy needs of the United States? It is estimated that there are 3.4 billion tons of recoverable coal in the disputed area. This would undeniably be a considerable contribution to the energy needs of our Nation. Furthermore if the area is not mined, the State of Montana would lose approximately 63 MM dollars in severance and gross proceeds taxes. I have read that it would only cost 100 MM dollars more to mine coal somewhere else. Who in government is so unconcerned with expending tax dollars that 100 MM is not even important?

1 DSL and OSM have no authority to determine the constitutionality of the laws. This is a function of the courts. DSL and OSM must administer those laws passed by their respective legislative bodies.

2 Your comment is noted.

I grew up on a Custer-Area ranch in this disputed area and I love that land as much as anyone could. I agree wholeheartidly with the conclusions reached in the Tongue River, Montana Petition Evaluation Document - concerning Vegitation and Soil, "with care in selection and placement of soils and overburden, soils can be reconstructed following mining of this area that would be more useful and productive than before mining", and concerning Hydrology, the document states " in summary, several scenarios of saline-seep development as a result of mining have been considered, and the conclusions do not support the allegation that large-scale saline seeps will develop after mining".

I will be present in Ashland on October 21 and 22 at the public hearings on this petition.

Sincerely yours,

Francis D. Penner

3 The quotation referenced here is not a conclusion of DSL and OSM and, thus, is not a conclusion of the draft document. This quotation is from the BLM response to the Tongue River petition which was reproduced in appendix C of the draft document.

4 Your comment is noted.

October 29, 1991

OSL -

We live and work within the Tongue River Unsuitability Petition Area and support a designation of unsuitable. The allegations of the draft evaluation point out that this valley could be irreversibly changed for the worse under the effects of large scale strip mining. 1

Thank you for your time and again we urge you to grant this area an unsuitable designation.

Sincerely,

Mr & Mrs Charles Clawson
Birney, MT

1 Your comment is noted.

October 29. 1981

Four Mile Ranch
Decker P.O. Montana
59025

Dear Commissioner Moon,

Agricultural land - often at highest quality is being ruthlessly & thoughtlessly eliminated in the U.S. by industrial development - highways - housing & mining. How short sighted this is when reclamation is not a sure thing & in the long run food production must be top priority for people everywhere.

1 Tongue River valley & the river itself is a priceless asset to its bordering local communities in particular - to Montana in general & to the whole U.S.

Agricultural land is the only sure renewable resource.

For all our sakes - please - let it be.

Sincerely,

Ellen Cotton

1 Your comment is noted.

Jim Deutsch
2[illegible] 7th Avenue North
Billings, MT 59101

October 21, 1981

Mr. Gareth Moon
Commissioner
Montana Dept. of State Lands
162 Eleventh Avenue
Helena, MT 59601

Dear Mr. Moon:

I would like to add my support to the petition, as filed by the Northern Plains Resource Council and three of its affiliate organizations, to designate lands in the Tongue River area unsuitable for surface mining. Although I am not a technical expert, I believe that the evidence presented me by the petitioners concerning the questions of reclamation and water quality is substantive enough to have the area designated unsuitable for surface mining at this time. 1

In my visit to the area last June, I was impressed by the rich and fertile -- not to mention scenic -- character of the Tongue River Valley. To disrupt the agricultural life and economy there, I believe, would be a mistake at this time.

As I understand it, unsuitability designations are reversible at a later date, if the circumstances should change. However, given the absence of any real and pressing need at this time for the coal in the petition area, I urge you and the Department of State Lands to approve the petition now to designate those lands unsuitable for surface mining.

Sincerely,

Jim Deutsch

1 Your comment is noted.

Nye, Montana
Oct 24-81

Comm. Gareth Moon
Mt. Dept. of State Lands
Helena, Mt.

Dear Commissioner Moon:

I am writing in support of the petition submitted by the Tongue River Agri. Prot. Assn., Tri County Ranchers Assn., and the Rosebud Prot. Assn., to designate certain lands along the Tongue River as unsuitable for surface mining.

I have been a rancher all my life and I am very concerned about what is happening to our agricultural land. Subdivision and development have taken much of Montana's Valley land. We are loosing our top soil at an alarming rate and Saline seep is taking its toll.

1

1 Your comment is noted.

In Montana our Valley and irrigated land is very important, to give us a balance of summer and winter livestock feed.

To surface mine and put a Railroad through the Tongue Valley is unthinkable! Many of these ranches will not survive if their winter feed base is jeopardized, which it will be with development. Salinity in the Tongue River will be a far reaching consequence for generations. Food is and will be one of our Countries greatest Strengths.

I urge you to move with caution on this decision as it entails much more than digging a hole in the ground, then Covering it up as though it were not there. Thank you.

(Mrs.) Mary Donohoe

P.S. Much of Montana's Agri. base and food for the nation is at stake by this decision.

Oct 24, 1981
Ashland, Mt

Sandy Johnson
Montana Dept State Lands
Capitol Station
Helena, Montana

Dear Sirs

I feel the Tongue River unsuitability petition should be rejected by the state of Montana.

I live south of the petition area on Otter Creek, + feel the land in the petition area is reclaimable under our present laws + the demand for coal should have no bearing on the reclaimability of the land.

I also feel we need some kind of employment for our young in the area.

Sincerely
Ted Fletcher
Ashland, Mt.

1

1 Your comment is noted.

Dear Mr. Gareth Moon,

Please help us to insure that the Tongue River Basin stay agriciturally coductive. Land is being lost all over the world to over population, greed, and lame brain business politics. DON'T LET IT HAPPEN HERE! Studies have already been conducted and also lessons from the past show us that this land is unsuitable for surface coal mining. I am sure you know all the other facts concerning this matter.

If we continue to needlessly consume farm land and what little true wilderness we have left, we will have slit our own throats and be hungary in more than our bellys. Please help us retain as much as possible the land's present integrity in the Tongue River Basin. THANK YOU!

1

1 Your comment is noted.

011

DIAMOND RANCH
RUSSELL AND GENIE MAY GARFIELD
FORSYTH, MONTANA 59327

October 31, 1981

Mr. Gareth Moon

Dept. of State Lands
Helena, Montana 59601

Dear Mr. Moon:

As we all contemplate the projected Nance Mine, Otter Creek mine and others on the Tongue and its drainages, we would recommend you consider a National Academy of Sciences study on energy which says: "We are exhausting fossil fuels, ruining soil fertility (emphasis added), unbalancing ecosystems, and distorting human values and institutions in the greatest energy-spending spree of all times, at the expense of future generations."

A quote from "Country Journal", November, 1981: "we have inherited the earth from our fathers; we are borrowing it from our children".

As we listened to the proponents of more coal mining on the Tongue River at the Ashland hearing Oct. 21st, it was obvious that proponents have no concern for even this generation of agriculturists, and, of course, none for our children. Note above quote. 1

We own land in the Tongue River drainage just 3 miles north of the petition area; 3 of our stockwater wells could be adversely affected by disruption of aquifiers in the coal mining process. They are not all wells which could be deepened; windmills can only pump to about a 300' depth.

The possibility, or even probability that 60 or 70 miles of nearly prime land along the Tongue would be sacrificed for a few million tons of coal, for which there is no firm promise of market at this time, is an appalling desecration of basic resources; historic and potential production of food from Tongue River lands has and will outweigh the nebulous market for low-grade coal.

Both of us, Russell as an SCS Board member, and I, as an ASCS committee member, are aware of the national policy with regard to proper use of our land, water and air; further mining on the Tongue and a ranch-splitting railroad are not in conformity with long term benefit to either agriculturists or the nation.

We did appreciate your bringing the hearings to Ashland, and your excellent staff supervision there.

Yours truly,,
Genie May Garfield

1 Your comment is noted. Please see the additional hydrologic analyses provided in chapter II and the responses to the Northern Plains Resource Council letter.

October, 30 1981
Ashland , Montana

Commissioner Garath Moon
Montana Department of State Lands
Capitol Station
Helena, Montana 59601

I am Sara Gaskill, and I have a ranch on Otter Creek. I am in favor of this Unsuitibility Petition. In the draft, it states that the water in Otter Creek (page IV-6) drainage would be unfit for livestock watering after mining.

1 I implore you to disregard mining in this territory, as it would disrupt ranching in this fine and wonderful country forever.

It is difficult enough in these trying times, to make a living in ranching, therefore, when the coal is not needed WHAT-SO-EVER, I see no reason to put added burdens on we ranchers.

Please give this letter your much needed consideration.

Very sincerely yours,

Mrs. Sara T. Gaskill

1 Your comment is noted.

Forsyth, Mt. 59327
Oct. 25, 1981

Sandi Johnson
Mt. D.S.L.
Capitol Station
Helena, Mt. 59620

Ms. Johnson, et al:

In the Petition Evaluation Document there were a number of inconsistencies and points of view, in the area of soils and spoils particularly, that were not mentioned often during the Ashland hearing. However, Richard Opper covered most of those points quite well, and I would encourage you to take thoughtful consideration of his findings and opinions.

Passing mention was made of ground-water flow in paragraph 2, page IV-4. I believe there has not been sufficient evaluation of all the factors involved to be able to state flatly that ground-water flow rates will continue to be the same after mining as before.

It is quite apparent that large clods roll to the bottom of the pit when a dragline refills the pit with spoils. I do not question that those clods allow free movement of water at first, when ground-water begins to establish its new level of movement across the bottom of the pit. I do not believe there has been enough consideration given to what will happen to those clods over time as they become saturated by ground-water. Wet clods buried under tons of material can hardly be expected to remain separate clods forever, no matter how hard they seemed to be when dry and exposed to air. Given time, and depending on the type of material in the clods that happen to be in any one area, it seems quite reasonable that some clods will "melt" together and become a barrier to water movement. 1

It would be possible to simulate changes in spoils materials by using large cylindrical columns of spoils materials for purposes of study. Water could be introduced to simulate precipitation and groundwater, and "windows" could be placed in the sides of the cylinders for observation. Added pressure might be added on top of the material in some cylinders in order to simulate the weight of spoils in mine pits.

This, of course, could not be done in time to have any effect on what is decided about the petition area, but I mention it to emphasize how little work has been done on the long-term permeability of some types of spoils material. We must do something more than hope for the best if it seems okay at first.

I believe some of the Montco people have said they expect only a 15% swell factor with the way they expect to handle their spoils. That means that for every 100 feet of refilled pit, the surface would settle fifteen feet as it returned to normal density over an unknown period of time. The settling time is not known. It is well known that settling of loose dirt never proceeds evenly, but that bumps and cracks and pits develop wherever loose dirt is piled. This, of course, will become much more evident in the flattened out surfaces we see now as compared to the old, steep spoils piles of yesteryear. I assume the packing of the surface because of topsoil handling has delayed evidence of this problem, but there are "reclaimed" areas now that are unsafe to ride across horseback because of cracks and holes. 2

Selective handling of spoils could place porous material on the bottom of the pit to allow permanent movement of water. However, if the structure was such that the main movement of the aquifer water was 20 feet up the side of the pit, then good transmissivity on the bottom of the pit would hardly be expected to re-connect the severed water channel that originally flowed 20 feet higher. I have commonly observed this sort of situation at Colstrip and have speculated on whether permanent transmissivity across the floor of the pit was finding an outlet near the bottom, or would it be possible to have to rise as much as 20 feet to find an outlet that would allow an exit for the amount of water that was entering. 3

While it seems unlikely the water would have to rise 20 feet for sufficient exit transmission, it does appear quite probable the water would have to rise some dis-

1 Although these wet clods of material will break down when placed in the rubble zone of a backfilled pit, they will not plug flow through the pit-floor aquifer.

2 A swell factor of 15 percent indicates that the volume of the material in question will swell 15 percent when it is disturbed. It does not follow that the material will subsequently revert to its former, undisturbed density in the forseeable future after mining. However, this might, in fact, occur over geologic time if the conditions necessary for recreating rocks or sediments as they existed before mining also occurred.

Uneven settling and piping has occurred at some mines. One mine has minimized nonuniform settling by delaying the final grading, topsoiling, and seeding until the spoils have settled. In addition, settling is currently being monitored at other mines in the State to better understand and possibly predict subsidence on mined areas. Finally, any reclamation surfaces that undergo undesirable settling (subsidence) during the period of bonding will require further reclamation work to repair those problem areas.

3 For the aquifers to become reestablished in the pit floor, the spoils in the aquifer zone must become resaturated by surface and upgradient recharge before flow can proceed beyond the disturbed area. The fractured channels you have observed do yield much higher quantities of water than the unfractured seam. Those fractured channels would be lost during mining.

tance above the pit floor, in at least some instances, to contact enough permeable material to carry the flow.

Perhaps the reason this general problem does not get addressed well is because the whole coal beam is considered by some people to be a large, very slow-moving layer of water. While this is probably true to some extent, it seems to ignore the fissures, or channels, that carry larger amounts of water at a relatively rapid speed. At Colstrip I have often seen these channels near the top of the coal seam, pouring water down the pit wall to the floor of the pit. I have no reason to believe those streams of water will ever enter the original channel on the other side of the pit again. But, they will soak down through a lot of spoil when the pit is refilled, taking soluble salts and alkaline material with it to the new (perhaps temporary) aquifer on the bottom of the pit.

3

Reclamation is much more than surface revegetation. Most of the mining I have seen so far turns out to be pretty radical alteration, rather than reclamation, of the ground-water system. On the Tongue River petition area the usual problems are magnified by salts and sodic problems as well as problems with the clay. These problems would be enough reason to declare the area unsuitable for surface mining even if there was no danger from an excess of boron.

4

In closing I would like to say I thought the hearing in Ashland was handled very well. It gave all points of view an equal chance to be expressed.

Yours truly,

Nick Golder

4

Your comment that "Reclamation is much more than surface revegetation" is acknowledged. The Montana act defines reclamation as "backfilling, subsidence stabilization, water control, grading, highwall reduction, topsoiling, planting, revegetation, and other work to restore an area of land affected by strip mining or underground mining under a plan approved by the department" (82-4-203(25) MCA). For a discussion of ground-water aquifer reestablishment see response 20, oral testimony. Salts and sodium are discussed in the draft document as well as in response to many comments. Boron is discussed in the responses to comments 72 through 74 of the Northern Plains Resource Council letter.

October 29, 1981

Commissioner Gareth Moon
Montana Department of State Lands
Capitol Station
Helena, MT 59601

RE: Tongue River Petition

Dear Mr. Moon:

I am writing this letter in support of the petition to designate certain lands along the Tongue River Valley as unsuitable for surface mining.

In a part of the country where water is such a precious resource, vital to agriculture and ranching, the first goal of management of said water should be to protect the water quality and quantity for protection of the agricultural industry already established and the renewable resource lands. The petition Evaluation Document (PED) indicates a high salinity hazard if intensive mining is carried out as planned, not only destroying surface water but also endangering ground water, not to mention the effects of increased water withdrawals of water for municipal and industrial uses.

Also, I would like to address the total development of the area. This petition presents a suitable forum to look at the implications of large scale mining of the area. It is obvious to all that we are not just discussing the development of one mine when a proposal to build a railroad is involved. The railroad would open up the Tongue River Valley to massive coal development. To be realistic and meaningful, the review should reflect the larger, long-term effects of many mines and a railroad that will cut a swath through 80 miles of the Tongue River Valley, severing farms and ranches, destroying drainage patterns of irrigated lands.

We need to weigh the destruction of renewable agricultural lands for decades against the one-time harvest of coal for the benefit of a few. (There is no demand market for coal at present - why should we sacrifice some of our best land for another mine?)

To preserve valuable water resources, renewable resource lands and productive agriculture in the Tongue River Valley, I urge you to designate certain lands in the Tongue River Valley as unsuitable for mining. Thank you.

Sincerely,

Deborah L Hanson

Deborah L. Hanson
719 N. Center
Miles City, MT 59301

cc: Department of Interior [illegible]
Governor [illegible]

1

1 Your comment is noted. While it is important to look at the impact of the railroad to the Tongue River valley, as the ICC is doing, DSL and OSM's decision can only be based on our analyses of the specific allegations with respect to the soils and hydrology of the petition area. The extent to which the Tongue River Railroad can be considered is explained in chapter I.

Tongue River Tags
Miles City, Montana
October 2, 1981

Montana Department of State Lands
Capitol Station
Helena, Montana 59601

Dear Sir:

A cry has been raised that this petition is an attempt to deny landowners the right to do what they want with their property. Coal on their land may cause their neighbors many damaging problems. Unfortunately these problems will not be minor irritants, but could include such adverse effects as social impacts in the Ashland, Kirney, and Otter areas; the contamination of irrigation water; the disruption, destruction, and pollution of aquifers and the list goes on.

Also, it is not only coal mining which would result in the "taking" of property rights, but the railroad to service those proposed mines could cut through the most productive land in the area, the rich, fertile haylands and prime farm lands of the Tongue River Valley. In some instances, the disruptive effect of the railroad on the farm or ranch could destroy its economical operation, forcing agricultural people out of business.

It seems like an extreme price to pay, not only now, but to keep paying long after coal is replaced by more efficient energy sources. We and our families want to live, farm and ranch here long after the coal is dug up and the companies have moved on.

This petition has not been frivolously filed to harass our neighbors or the coal mining industry. This petition was filed because it is a way for agricultural people who want to stay in business to get a realistic look at the cumulative impacts we may suffer from developing our Tongue River country.

Sincerely,

Hubert Harwood

1

1 Your comments and explanations are noted. Additional hydrology information is presented in chapter II. See also chapter I for a discussion of the Tongue River Railroad.

R MY

R BAR RANCH
BIRNEY MONTANA 59012
October 27, 1981

Sandi Johnson
Montana Dept. of State Lands
Capitol Station
Helena, MT 59620

RE: Tongue River, Montana, Petition
Evaluation Document, draft

Dear Ms. Johnson,

Enclosed is a copy of plans for a strip mine near Birney, Montana.

1 In support of the Tongue River Unsuitability Petition and in addition to the comments that I gave at the hearing in Ashland on October 21, 1981, I would like to enter these plans in the record.

The plans show that there is a potential for massive strip mining along the Tongue River within the Petition area.

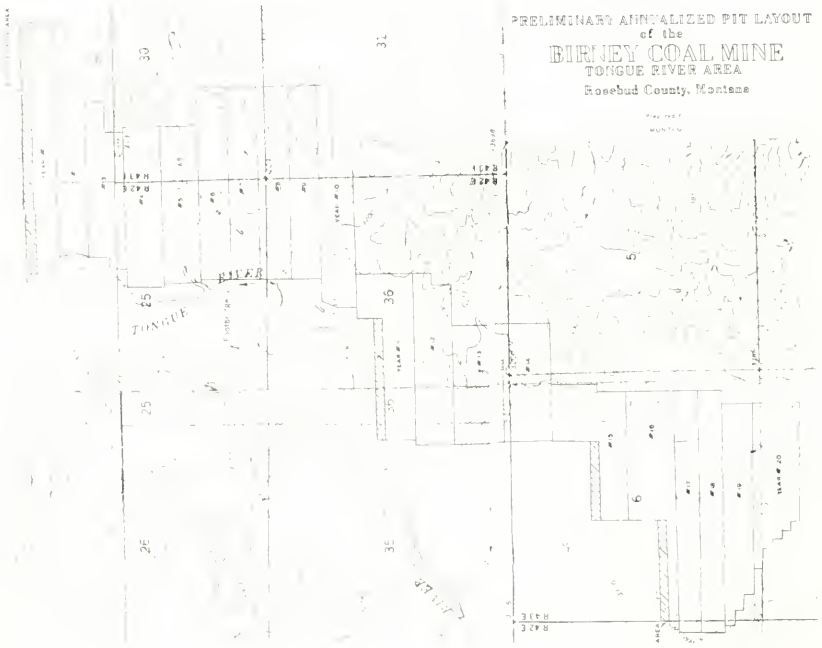
Thank you.

Sincerely yours,

Art Hayes Jr.

117

1 Thank you for submitting a map for a proposed mine in the Birney area.


PRELIMINARY ANNUALIZED PIT LAYOUT
of the
BIRNEY COAL MINE
TONGUE RIVER AREA
Rosebud County, Montana
TONGUE
RIVER
CREEK

[illegible]
[illegible]
[illegible]

Governor [illegible]
Capitol Station
[illegible]

Dear Governor [illegible]:

[illegible] my view about [illegible] ation to [illegible] Tongue River lands as unsuitable for surface mining.

I am [illegible] of two children. I resided in [illegible] moving to [illegible] to attend [illegible] Law School in 1979. I have [illegible] approximately [illegible] in the Tongue River area in the last two years. I prefer to [illegible] my outlook on land issues as that of a rational ecologist; [illegible] growth is inevitable but demanding that long-range planning [illegible] considerations be incorporated into [illegible] process.

1 [illegible] cumulative effects of, for example, coal [illegible] on both the land [illegible] economy [illegible] upon the land long after the [illegible] ceased. Often it is too [illegible], I believe, irresponsible [illegible] governing body to take an isolated, [illegible] approach to individual projects [illegible] for similar [illegible] culminate in irreversible [illegible] ecological and economic loss.

In the [illegible] River area, the [illegible] proposal is for a [illegible] to [illegible] to [illegible] at a time other mines [illegible] by [illegible] will [illegible] down the Tongue [illegible] the railroad [illegible] which use that [illegible] water aquifers, runoff which [illegible] the railroad [illegible] of [illegible].

[illegible]

[illegible] thank you [illegible].

[illegible],

[illegible]

1 Your comment is noted.

Montana Department of State Lands
Attention: [illegible]
[illegible]
Helena, Montana [illegible]

To Whom It May Concern:

This statement is made concerning the Tongue River, Montana, Petition Evaluation Document. I request that this statement be made part of the hearing record in support of the petition to designate certain lands in the Tongue River basin as unsuitable for mining.

1 Although apparently well conceived, the Petition Evaluation Document has a major flaw which substantially reduces its effectiveness. Throughout the document soils and hydrology are treated separately. However, soils and hydrology are inexorably linked; they cannot be considered separately. The physical environment is a system in which all parts are interrelated; complex interactions take place between the soil subsystem and the ground-water subsystem. An understanding of ground-water/soil interactions is necessary before making a decision concerning the suitability of the petition area for mining. Unfortunately, this understanding does not come forth from the Petition Evaluation Document.

2 3 4 Gaps of information exist in the Petition Evaluation Document. The document (1) does not include effects of municipal and domestic water use, (2) does not include the impact of above-dam water use, and (3) the effect of several mines on the petition area. By ignoring these important issues an incomplete document has been compiled.

5 The Petition Evaluation Document sidesteps increased industrial and municipal appropriations due to lack of data (p.IV-17). Increased appropriations will progressively dewater the Tongue River, further concentrating increased TDS due to mining. At any rate, to sidestep an issue due to lack of data is a serious flaw.

6 Six active mines and five potential mines exist upstream of the petition area. The Petition Evaluation Document totally ignores the impact that upstream mines will have on the Tongue River (p.IV-17-18). This is a serious flaw.

7 The Petition Evaluation Document acknowledges that the proposed mines will significantly degrade the quality of the Tongue River (p.IV-10). During periods of low flow a "high to very high" salinity hazard will exist. The impact of increased salinity is considered to be "long term". However, according to Montana law degradation that will impact established beneficial uses is not allowable (p.IV-2). Yet the Petition Evaluation Document firmly establishes that water quality will be degraded so as to preclude irrigation and livestock watering.

The Petition Evaluation Document acknowledges a "very high" salinity hazard for ground water in the Tongue River alluvium (IV-7,10). TDS levels (mg/ℓ) are predicted to range from 1,087 to 2,50[illegible]. This would preclude using ground water from the alluvium for irrigation. The salinity hazard

1 We would certainly agree that soils and hydrology are interrelated and should be considered as such to the extent possible. The interrelationships were acknowledged, at least implicitly, in the responses to the allegations involving: (a) water quality and overburden chemistry (draft document, p. IV-6), (b) reclamation failure, erosion, and sediment loads in the Tongue River (draft document, p. IV-19 through IV-20), (c) saline seep development (draft document, p. IV-21), (d) migration of salts after mining (draft document, p. IV-34), and (e) translocation of salts (draft document, p. IV-36). Finally, the additions and revisions presented in chapter II regarding the Van Voast and USGS water-quality model evaluations intimately involve the relationship of water quality to overburden chemistry as a result of disturbance.

2 Future municipal and residential water withdrawals have been included in computer runs on the USGS water-quality model for this final document. The figures used for the increased withdrawals were taken from the Yellowstone impact study final report (Montana Department of Natural Resources and Conservation, 1981). The results of using increased withdrawals are presented in chapter II.

3 DSL and OSM have taken into account above-dam mining impacts for the final document. The initial attempt by the department utilized regression equations to derive output values at the Tongue River Dam for the initial input for the Woods model. These regressions showed very poor correlation and, therefore, were dropped. For the purposes predicting upstream impacts, the upstream values for mine spoil water quality were directly used as the initial input into the Woods model. This method represents an extreme worst-case situation, as the reservoir is believed to act as a trap for many of the constituents in the water. The results are discussed in chapter II.

4 The effect of several mines on the petition area was calculated for the draft document. (See p. IV-10 and table IV-4 of the draft document.) Additional mining impact was modeled for this final document, the results of which modeling are shown in chapter II.

5 To admit that data are lacking is not sidestepping an issue; rather, it is simply a statement of fact. Current predictions on industrial withdrawals have been on a basin-wide basis. In attempting to make a meaningful assessment, the locations of withdrawals becomes critical. For the final document, industrial withdrawals have been incorporated, using data from the Yellowstone Impact Study Final Report (Montana Department of Natural Resources and Conservation, 1981). These results are presented in chapter II.

6 Please note that on page IV-19 of the draft document a commitment is made to assess upstream impacts. This analysis was conducted (see response 3 to this comment); results from it are presented in chapter II.

7 Abe Horpestad of the Montana Department of Health and Environmental Sciences, Water Quality Bureau (written communication, June 16, 1981), has stated that: "At this time, we cannot tell you specifically how the nondegradation provisions of the 75-5-503 MCA will be implemented in our rules. Thus, we cannot tell you now how they will apply to water quality changes resulting from mining."

- 7 -

7 would remain at a high level for an undetermined period after mining. Shallow ground water in the Tongue River Member of the Fort Union Formation would become contaminated by mining (p.IV-6). Van Voast predicted that water quality would change, especially TDS content. TDS was projected to range from 5,621 to 6,181 mg/ℓ compared to a premining level of 2,310 mg/ℓ. Ground water which was adequate for livestock consumption prior to mining would be considered unfit for such use after mining. Virtually all of the shallow aquifers would be contaminated. BLM analysis of Otter Creek (p.IV-6) indicated that the salinity of ground water in shallow aquifers of the Tongue River Member of the Fort Union Formation and the Otter Creek alluvium would render the water unfit for consumption by livestock. As virtually all of the ranching operations are headquartered along the stream on the fertile alluvium, this would create a significant hardship for the ranchers.

8 The alluvial aquifers in the Tongue River and Otter Creek valleys are generally more productive than bedrock aquifers (BLM report, p.10). Also, the shallow water tables can provide subirrigation for crops on the valley soils. Thus contamination of these aquifers by mining has a very detrimental effect on the ranching industry and cannot be mitigated simply by drilling to a deeper aquifer.

9 The Petition Evaluation Document does not address the hydrologic functions of the alluvium. By not considering the alluvium in detail one of the primary concerns of the original petition has been ignored. A delicate hydrologic balance exists in the clinker areas. Here water infiltrates into the ground becoming ground water. It is likely that reclamation efforts will not be able to restore premining infiltration rates (p.IV-36). The Montana Dept. of State Lands and the Office of Surface Mining have determined that about 20 percent of the petition area is clinker. This area should be excluded from mining.

10 The Bureau of Land Management, Bureau of Reclamation, Department of State Lands, Office of Surface Mining and Montco Coal Company present either data or statements that "highly saline and sodic" soils occur throughout the petition area and that significant amounts of "unsuitable" overburden also occur (p.IV-[illegible],[illegible]). I interpret these statements to mean that reclamation will probably not be feasible and, at best, will be most difficult. Water quality in this area will be severely impacted should mining occur.

11 To conclude, based on my intimate knowledge of the Tongue River Basin and on a careful reading of the Petition Evaluation Document, I believe that at least part of the petition area could not be reclaimed in accordance with federal and state law. Furthermore, surface mining operations in the petition area will result in a significant and irreparable reduction in water quality, resulting in a loss of fiber production. I have no doubt that the cumulative impact of mining on water would be serious, permanent, and deleterious.

[illegible]
David [illegible] Hickcox, Ph.D.
Assistant Professor
[illegible]

7 It should be noted that standards for TDS are somewhat arbitrary, as the hazard depends largely on the cations present in the water, on soil types, and on methods utilized for irrigation (Hayden Ferguson, oral communication, October 1981). However, the range of 1,687 to 2,506 mg/L TDS of the Tongue River alluvium does not necessarily preclude the use of the water for irrigation on the basis of the EPA Water Quality Criteria of 1972 and the EPA Water Quality Criteria of 1976. Again, it should be noted that the range of 5,621 to 6,181 mg/L does not necessarily render the shallow ground water of the Tongue River Member unsuitable for livestock (U.S. Environmental Protection Agency, 1973, 1976).

The BLM report on the Otter Creek area (appendix C, draft document, p. C-14, C-15) concludes that the concentration may affect the desirability for stockwater but does not preclude such use, as it is well within the range commonly used for stockwater in southeastern Montana.

8 Your comment regarding the productivity of aquifers is noted; please see the revised hydrologic evaluation presented in chapter II. Montana law requires that coal mines be designed to minimize disturbance to the hydrologic balance of the area in question and to preserve the quality and quantity of affected waters (82-4-231 MCA). In those instances where subirrigated areas fall within certain alluvial valley floors found to be significant to a farming operation, such areas may not be mined (82-4-227 MCA), nor may the quantity and quality of the waters subirrigating the alluvial valley floors be materially damaged (82-4-227 MCA). Lastly, where it can be shown that mining has adversely affected a landowner's water supply, DSL can require a coal company to probide the landowner with waters of like quantity, quality, and duration of use (82-4-253 MCA).

9 The alluvial system is highly complex and highly dependent on numerous site-specific factors that are not uniform throughout a drainage basin. This complexity precluded a detailed study of the alluvial system, as it is beyond the scope of the petition evaluation document. The USGS water-quality model (Woods, 1981) assumes that the quality of the mine-spoil water will remain unchanged, as this water flows through the alluvium. The Van Voast model does address recharge volume and quality in the alluvium (page D-3 of the draft document).

Of the 20 percent of the petition area that is clinker (38,860 acres), only 2.7 percent of that 20 percent would be disturbed (1,060 acres) if all surface-minable coal is extracted. This clinker, which is less than 1 percent of the total petition area, is highly dispersed throughout the central part of the petition area and Otter Creek. Therefore, mining should not significantly affect recharge through the clinker.

10 Significant amounts of saline and sodic soil and overburden materials are in the petition area, as pointed out on pages IV-24 through IV-26 of the draft document. However, please reread the paragraph at the bottom of page IV-27 of the draft document, which additionally indicates that significant volumes of suitable material also occur within the petition area. The interpretation that reclamation, in the sense of revegetating the disturbed surface, will probably not be feasible is incorrect. Such reclamation may be difficult in some areas, but "difficult" is not equivalent to "unfeasible," and the difficulty of reclamation is not a legal criterion for a decision on an unsuitability petition.

11 Your comments are noted. Please review the updated analysis in chapter II.

PATTY KLUVER
Route 1
Forsyth, Montana 59327

Oct. 28, 1981

Mr. Gareth Moon
Commissioner, Dept. of State Lands
Capital Station
Helena, Montana 59601

Re: The Montco Mine

Dear Mr. Moon:

When you were in Ashland, last week, I told you that I intended to write regarding the mine, and the adverse effects.

As a life-long resident of this area, be assured we have had ample opportunity to sample the contents of the various small coal mines of the area.

We have used the coal from Colstrip in our "stoker," as well as that of the Coal Creek mine, east of Ashland. Neither is really worth hauling. The clinker and the low heat derived from the two beds has forced us to conclude either vein might better be called something other than coal mines, like Ash land or some such more fitting monitor.

As was pointed out at the Hearing, we are already experiencing considerable degradation to the ground water of the area, in some places for as much as 500 ft. depth. This isn't happening in that mystical 2 mile radius the Coal Companies suggest, but as far away as 6 to 10 miles. The Coal Companies know better than that the groundwater will be adversely effected for only 2 miles outside the mine area, but that is as far as their Consultants are authorized to study.

While none of our ranch property lies within the petition area, that south of our property in the Greenleaf-Rosebud region, a part of the Peabody acquisition, will impact the water of Rosebud creek just as severely as that at Colstrip, due to the dumping of ground water into the surface waters of Rosebud creek.

In the final decision, the question must be, "Do the Agencies of Government and the Mining proponants have the right to destroy the property of their neighbors in pursuit of extracting the last penny from their own? The decision is yours, Mr. Moon, and I know it is extremely difficult.

Sincerely,

Patty Kluver

122

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1 Your comments are noted. As you know, the departments are reviewing the cumulative hydrologic impacts of mining in the Colstrip area. Many of the problems you mention will be analyzed in the comprehensive environmental impact statement now being prepared on this area.

VIRGINIA T KOCH
500 CENTER CREST DR
CLAY CENTER NE 68933

October 4, 1931

Department of State Land
Gareth E Moon, Commissioner
1625 Eleventh Ave.
Helena Montana 59620

Dear Mr Moon,

1 It is absurd that a small group of environmentalists, the NPRC, can create a situation in the Tongue River valley and related areas, that might take away all coal mining rights because the mining might make waters unfit for irrigation. The NPRC states that surface mining on the Tongue River would make it and its tributaries unfit for agricultural use because of saline seep. This is needed on

1 Your comment is noted. Please see response 1, Beumee letter.

VIRGINIA T KOCH
500 CENTER CREST DR
CLAY CENTER NE 68933

1

page IV - 2 of the Tongue River Montana Petition Evaluation Document stating that the Tongue River generally has the best water quality among streams in the coal region of southeastern Montana. Also on page IV - 3 it states that replaced topsoils over spoil at the Decker mine were compar-ble to those of adjacent unmined soils.

How can the government, state and federal, take away the rights of surface and mineral owners without compensation? With 3.4 Billion tons of coal in the designated area, it is my belief that coal should be allowed to be mined there.

Sincerely
Virginia Koch (Mrs Robert)

1507 Pleasant
Miles City, MT
30 Oct 81

Commissioner
Dept. of STATE LANDS
Helena, MT 59601

DEAR MR. MOON,

I Am writing in support of the Northern Plains petition of unsuitability For coal mining in the Tongue River Valley.

1 Since the published research of the 1978 National Coal Policy Report, it has been evident that strip mining in Alluvial valley Floors is incompatable with potable ground water Flows, and will probably render irrigation water too saline to be useable.

I urge you to only allow mining in Areas where there will not be such a severe impact on the WATER Quality.

Sincerely,
Connie Krantler

1 Your comments are noted. Please see figure III-1 of the draft document, additional hydrologic information presented in chapter II of this document, and the responses 8 and 9, Hickcox letter.

Lazy E. L. Ranch
Roosevelt
Oct. 29, 1981

Commissioner Gareth Moon,
Montana Dept. of State Lands
Capitol Station
Helena, Montana 59601

Dear Commissioner Moon:

We are actively engaged in the livestock industry & wholely support the petition of our friends on the Tongue River. We find the idea of industrialization of that area repugnant because it would be detrimental to the existing agricultural production.

It has become clear that additional coal production in Montana is not needed as the demand for that product has softened. It has also become clear that the more energy costs, the less people will use it. Recent declines in oil consumption proves that point.

Water is essential to any agricultural pursuit. Coal production in the Tongue River area threatens both water quality & quantity available to existing ranches. We feel that agriculture is a reliable

1 Your comment is noted.

industry that has sustained this nation
since the founding of the Republic and
that agriculture should be given the recognition
its due. We urge you to support the
Tongue River Petition.

Sincerely,

W R Mackay Jr

Mary Ann Mackay

October 31, 1981
Ashland, Montana 59003

Commissioner Gareth Moon
Montana Department of State Lands
Capitol Station
Helena, Montana 59601

Dear Commissioner:

1 I would like the following addendum attached to my testimony given at the hearing held in Ashland, Montana on October 21st and 22nd.

Please do not take my soil test and statements lightly, as I have 1,200 acres under irrigation in one parcel.

2 Also, please note paragraph 2 on page I-12 stating that Congress has designated certain areas unsuitable for surface coal mining including Custer National Forest. Reasons which Congress used in this decision should be checked in the Federal Register and included as part of this evaluation.

The petition area being adjacent to and of similar or the same soil and hydrological types should be considered the same as the Custer National Forest which has been designated off limits to mining by Congress as mentioned on Page I-12.

Sincerely,

Herb Mobley

1 DSL and OSM have refined the assessment of lower water quality on irrigated land in the petition area. (See chapter II.) We appreciate and have used the soil analysis you provided in this assessment.

2 Custer National Forest is one of the areas Congress chose to designate as unsuitable for mining by statute, and not for reasons of impacts to soils or hydrology which might result from mining.

MONTANA FARM BUREAU FEDERATION
P.O. BOX 1207 — 125 WEST MENDENHALL — BOZEMAN, MONTANA 59715
Dial 587-3153

October 20, 1981

Sandi Johnson
Montana Dept. of State Lands
Capitol Station
Helena, MT 59620

Dear Miss Johnson:

On behalf of the Montana Farm Bureau Federation I want to express our concern that the findings relative to Salinity and flow modelling reported on pages IV-6 and IV-7 of the Tongue River Montana, Petition Evaluation Document, if accurate project water of such diminished quality as to render it unfit for livestock watering and hazardous for irrigation.

1

Farm Bureau Policy as adopted by our delegates in Convention in Great Falls in December 1980 reads in part, "We recommend that any development in all Montana drainages not interfere with the future needs of agriculture.....". It is our sincere hope that you will give serious consideration to any decrease in water quality which would likely occur as a result of large scale mining development and take whatever precautions are necessary to prevent such degradation.

Sincerely,

William W. Brown
Exec. Vice President

cc Ray Ravenscroft
Margie McDonald

1 Your comments are noted. Further revision of our analysis may be found in chapter II. The classification of water on the basis of TDS in relation to the hazard for both irrigation and stockwater is highly dependent on the cations present and methods of use.

[illegible] Lane
Billings, Montana, [illegible]
16 October [illegible]

Mr. Gareth Moon, Commissioner
Montana Dept. State Lands
1625 Eleventh Avenue
Helena, Montana, 59601

Dear Mr. Moon:

After careful study of the Tongue River Basin I am convinced that it is unsuitable for strip-mining coal and should be kept as agricultural land.

1 The cumulative effects on hydrology from massive mining would degrade the Tongue River and jeopardize its use as a source for irrigation water. Neither could the strip mined lands be successfully reclaimed.

If there were not other options open, this would present a different picture. Please study the other options. Once Montana land is desecrated, spoiled and used up it will present a sorry situation.

Sincerely,

Ester Murray

Ester Murray (Mrs. John A.)

1 Your comment is noted.

NORTHERN PLAINS RESOURCE COUNCIL

Field Office
Box 858
Helena, MT 59601
(406) 443-4965

Main Office
419 Stapleton Building
Billings, MT 59101
(406) 248-1154

Field Office
Box 886
Glendive, MT 59330
(406) 365-2525

October 30, 1981

Sandi Johnson
Montana Department of State Lands
Capitol Station
Helena, MT 59601

Dear Sandi:

Enclosed you should find the following documents:

1) NPRC supplementary comments
2) Exhibits 1, 2, and 3
3) Legal memorandum by James A. Patton
4) Statement and supplement by J. Russell Boulding
5) Supplementary comments by Richard Opper
6) Statement by Fred M. Sandoval
7) Statement by Pat Jobes

Arriving under separate cover is the written statement of Charles Andrews, which is also a component of this package.

Sincerely,

Margaret D. MacDonald
NPRC Staff

Enclosures

NORTHERN PLAINS RESOURCE COUNCIL

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COMMENTS ON THE TONGUE RIVER UNSUITABILITY PETITION
AND PETITION EVALUATION DOCUMENT (DRAFT)

Supplement to Hearing Testimony

INTRODUCTION

When Northern Plains Resource Council, Tongue River Agricultural Protection Association, Rosebud Protective Association, and Tri-County Ranchers Association filed the Tongue River Unsuitability Petition in the Fall of 1980 several points were emphasized.

1) It was our intent to prompt a timely review of an area we believed clearly should not be opened for coal strip mining.

2) The petition was timely because the proposal to construct a $150 million coal-hauling railroad to the petition area necessitated an area-wide assessment of the cumulative effects on agriculture of mining 30-60 million tons (or more) of coal annually in the petition area.

3) No mines have been permitted within the petition area and the single mine application on file was at its initial stages of processing and would not be adversely affected by the processing of the petition should the unsuitability designation fail. Also, no federal coal has been leased in the petition area.

4) It was our objective to cooperate with the federal and state agencies sharing dual jurisdiction over the lands in the petition area. We strongly advocated a cooperative approach to the petition's processing and the avoidance of duplication between the two agencies.

Ten months down the road, with the publication of the Petition Evaluation Document and the public hearings, Montana Dept. of State Lands and the Office of Surface Mining are to be commended for their cooperative approach to the process and their attention to this matter under almost insurmountable time constraints and an extraordinarily high turnover in federal OSM personnel at mid-stream as the new administration assumed control of the agency. The next 60 days will be critical as the PED needs considerable revision and should plug numerous holes acknowledged in the document and identified at the hearings and in written comments.

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1

1 Your explanations and comments are noted.

The Tongue River Unsuitability Petition is consistent with the clear mandate and recorded intent of Congress in passing Section 522 of the Surface Mine Control and Reclamation Act (SMCRA). It is a planning mechanism. To quote from the House Committee report:

> The process for designation of land areas as unsuitable for surface coal mining is also premised on the notion that successful management of surface mining depends, in large part, on the application of rational planning principles. (emphasis added)...In some circumstances, therefore, coal surface mining should give way to competing uses of higher benefit.

It is NPRC's conviction that the petition area presents a combination of unique circumstances that precisely evoke the purposes for which Section 522 was enacted.

1 A designation of the petition area as unsuitable is justified, as we will further delineate in these comments and accompanying statements. It is important to acknowledge, at the outset, that such a designation can be withdrawn, terminated, or modifed at some future time should significant new evidence come to light or circumstances change. The coal resource remains in safe storage if such a time comes to pass.

OVERVIEW OF THE CASE

A sound technical and legal case argues for a designation of unsuitability grounded on the mandatory requirement for designation based on the economic infeasibility of reclaiming lands in the petition area to the standards of state and federal law; and under the discretionary authority to prohibit mining where operations could result in a substantial loss or reduction of long range productivity of water supply or of food or fiber products.

A. The record supports a designation of unsuitability based on the economic infeasibility of reclamation in the petition area. Petitioners have submitted statements from J. Russell Boulding, Richard Opper, and Fred M. Sandoval identifying severe environmental constraints of sodium, salt, and boron within the petition area that would require exceptional measures to attempt to reclaim.

2 1) In addition to salts and sodium, laboratory data shows that about 25% of the soil and overburden sampling sites at the Montco site have high boron levels. (Refer to Sandoval statement) Boron is toxic at high levels to plants and cannot be rendered nontoxic by chemical amendments. Current reclamation practice and understanding in dealing with these elements supports special handling, [illegible] and some scientists advocate leaching by means of irrigation

2 Please see the responses to comments 72 through [illegible] of this letter

tion. In the context of the Tongue River Basin, where salinity presents a long term hazard, leaching soluble salts in soils and overburden merely transfers the problem to the hydrologic system.

2

2) Regardless of whether there is sufficient material to adequately bury toxic sodium, salts, and boron and to insulate the expected aquifer, the mining and reclamation practices necessary to achieve such an objective are economically prohibitive in the face of competitive coals in the region compared to petition area coal. (See Russell Boulding statement).

3

3) In the absence of long term scientific research and data on the effectiveness of sodic and salty soils and spoils reclamation handling practices, lands in the petition area should not be mined. Research in North Dakota by Dr. Gerald H. Groenewold (see Exhibit 1) indicates that the burial of such elements may only postpone their adverse impacts on reclamation success.

4

4) Lands must be designated unsuitable where reclamation is not economically feasible. (See J. Andrew Patton brief).

5

5) As will be pointed out in our comments on the PED, the agencies failed to review the tract profiles (BLM, 1981) for proposed federal lease tracts within the petition area. These documents lend support to NPRC's allegations and arguments regarding the obstacles to reclamation success for the petition area. (See Russell Boulding and Richard Opper statements)

6

B. The Commissioner and the Secretary hold discretionary authority to designate the area unsuitable based on the substantial loss or reduction of long range productivity of water supply and of food or fiber products that could result from large-scale mining in the petition area. The record strongly supports the exercise of this authority to designate the petition area unsuitable.

7

1) Although the model employed to estimate long-term impacts on the Tongue River is flawed (see Charles Andrews statement), it identifies the very high salinity hazard that would accrue in the Tongue River during critical lower flow periods when irrigation water is essential to agriculture (refer to Herb Mobley, Greg Waldie, Rob Green, Keith Powell, et al., in hearing record).

8

2) The modeling of Tongue River water quality, contrary to the assertion in the PED, is far from "worst case," and should be modified appropriately to approximate worst case. In addition to Dr. Andrews' salient points regard-

3

Please see the detailed response to comment 59 of this letter for additional information in chapter I. Such costs can best be determined and evaluated only upon completion of a mining operation design and an established production process. There is no indication at this time, however, that such additional costs would be of sufficient magnitude to clearly make coal mining reclamation economically unfeasible.

4

We do agree that many questions concerning the long-term effect of disturbance of sodic and saline overburden materials remain to be answered. A designation of unsuitability for mining may not be made, however, without supporting evidence demonstrating that the adverse impacts alleged in the petition would occur. We are attempting to address these questions through various monitoring efforts on mine soils (discussed in the draft document) and through monitoring of the postmining surface and ground water. Regarding subsidence of spoils, please refer to response 2, Golder letter.

5

Your statement is correct; however, there is no indication at this time that coal mining reclamation in the petition area is clearly economically unfeasible. Please refer to chapter I for additional information.

6

Please see comment 25 in chapter III.

7

DSL and OSM disagree that the USGS water-quality model employed is flawed (see response to Charlie Andrews' written statement). The prediction of the salinity hazard has been refined for this document by taking into account methods of water use, soils, and crops being irrigated and by modifying the mine leachate inputs into the model. Please refer to chapter II.

8

DSL and OSM believe that the water-quality model output evaluated in the draft document represents a "worst-case" scenario in terms of mined acreage, rather than an overall "worst case." As stated on pages IV-17 and IV-19 of the draft document, DSL and OSM did not take into account cumulative impacts which may increase the degradation of water quality. These refinements have been completed with the results being given in chapter II.

8 ing the model's deficiencies, several additional factors must be incorporated.

8a a) The river can be expected to flow at significantly lower levels than the instream flow reservation of 75 cfs at Miles City. For example, in April, 1981, stream flow was measured at 7 cfs at Miles City.

8b b) The requirements for municipal and domestic water that will accompany each mine must be factored into the water quality equation. Although these numbers are necessarily hypothetical, socio-economic impact assessment methodologies provide guidance in estimating population impacts from strip mines, and environmental science provides guidance in assessing the water requirements of a population. This is a significant factor that cannot be ignored.

8c c) Since Cities Service has publicly expressed an interest in mine-mouth conversion of petition area coal to synthetic fuel (see Exhibit 2), it is reasonable to run a worst case model incorporating a major industrial facility with concommitant industrial and municipal water requirements.

8d d) The document has not incorporated the long term effects of existing, planned for, and expected mines in the Tongue River Basin above the petition area.

9 3) The document has failed to consider the combined effects of applying highly saline water to alkaline soils (refer to Herb Mobley's hearing statement).

10 4) The long-term (centuries-long) nature of the mine-induced salinity on Tongue River, coupled with the irreversibility of the damage once mining has occurred, reasonably dictate not only the consideration of worst case factors, but also the necessity of incorporating a safety margin for error.

11 5) The economics of coal transportation from the petition area dictate an areawide designation of unsuitability. The railroad will not be viable at anything less than 40 million tons and probably more will be required. (See Eugene Boulding's statement). This point is highly consistent with the rational planning principles contemplated by Congress in passing Sec. 522 of SMCRA. (See Andrew Patten brief).

12 6) Mean stream flow conditions are essentially meaningless in considering impacts on the river from mining. The river is utilized to agriculture in the late summer when flows are lowest.

8a DSL and OSM agree that flows lower than the instream flow can occur; however, historic low flows cannot be modeled with the new reservoir in place, as this factor must be based on actual data. In the DSL/OSM analysis, it is assumed that projected impacts will not be felt on the Tongue River for 50 to 100 years (Woessner and others, 1981). Based on this assumption, it was felt that the modified Tongue River Dam will be in place prior to the impacts on the river.

8b This factor has been calculated for this document based on the Yellowstone Impact Study Technical Report (Department of Natural Resources and Conservation, 1971) and the Yellowstone Impact Study Final Report (1981). The results may be found in chapter II.

8c See the response to comment 8b of this letter.

8d The impacts of potential and active mining are considered in chapter II.

9 Chapter II considers the effects of saline water on various soil, to better determine the actual suitability of the postmining water for agricultural purposes.

10 Your comment is noted. To the extent possible, worst-case conditions were analyzed. There does not appear to be a way to evaluate the safety margin for error in this situation, particularly in light of the timeframes involved.

11 The economics of coal transportation is not one of the factors for designation, was not an allegation of the petition, and is based on far more coal than just that within the petition boundaries. The results using the coal transportation model under the limited leasing scenario for 1995 indicate the potential for 44.5 million tons to be produced in the petition area. Although this amount is larger than that level reported to be required to support the construction of the railroad, a decision to construct the railroad would depend on actual market conditions as perceived by the participants in coal market transactions. See also the "Criteria for Designation" and "Economic Feasibility of Reclamation" sections in chapter I.

12 DSL and OSM disagree that the analysis of mean stream flow impacts is meaningless. Water is also used at mean streamflow and analysis of it provides background information. It should be realized that elevated TDS levels at from mean through low streamflows can affect crop production over the long term, depending on method of irrigation and soil type. DSL and OSM agree, however, that the most critical situation is during low flows in the irrigation season.

13 7) The demand for coal is to be considered before deciding to designate an area unsuitable. In this case the evidence overwhelmingly argues against opening a new coal area in the Powder River Basin for production in the upcoming 10-15 years (i.e. foreseeable future). (See Russell Boulding statement and Wallace McRae hearing statement)

14 8) The PED has entirely failed to identify the beneficial effects on agriculture and productivity both in the petition area and below it that will result from designating the area unsuitable.

15 9) Sections 510 and 515 of SMCRA, regarding the alluvial valley floors in the west, must be considered (as explained by Russell Boulding statement) when contemplating the decision under the discretionary criteria.

16 10) In conforming with the rational planning principles of the petition process and the state and national Environmental Policy Acts, more consideration must be given to the socio-economic impacts of industrializing the petition area. This is a legitimate factor in any discretionary decision. The area presents complications and problems of exceptional magnitude with respect to absorbing the rapid influx of large numbers of people needed to open and operate mines and industrial facilities (see Patrick Jobes statement and subsequent comments herein on PED).

CRITIQUE OF THE PETITION EVALUATION DOCUMENT

(This critique is supplementary to statements of Charles Andrews, Russell Boulding, Richard Opper, Art Hayes, Jr., Margaret Blum, Gary Ochsner, Mary Daniels, Greg Waldie, Al Leatherberry, Virginia Sprague, Jack Dodds, Rob Green, Irv Alderson, Jr., Herb Mobley, J. Donald Ochsner, Jack Bradley, Wallace McRae, Patty Kluver, Tom Ketchum, Bill Pauley, Keith Powell, and Nick Golder.)

Page I-2 - While the Petition Evaluation Document (PED) is not an environmental impact statement, per se, we concur with the agencies' acknowledgement here that it still must fall within the regulatory umbrella of the National Environmental Policy Act and the Montana Environmental Policy Act. Comments that follow herein will identify areas wherein we feel the document falls short of such compliance.

17 Page I-7 - The B-2e classification of Tongue River water under Montana's water quality standards and the legal prohibition against degrading such water below its beneficial utility for municipal, agricultural, and recreational purposes should be emphasized at the outset. Others have also pointed this out. The PED should highlight those points in the salinity model in which the water quality would preclude or impair beneficial uses for which the water is currently classified.

13 The first part of this comment is correct. Before designating any area as unsuitable, the agencies must prepare a detailed statement on the demand for coal resources. This statement may be taken into consideration in reaching a decision, under the discretionary criteria, as to the unsuitability of the petition area for mining. It also provides a scenario of the consequences of a decision to designate an area unsuitable. See also the "Criteria for Designation" and "Economic Feasibility of Reclamation" sections in chapter I, as well as chapter III of the draft document.

14 Your comment is noted. Please see page V-1 of the draft document and additional discussion in chapter II of this document.

15 See response to comment 41 of this letter.

16 Socioeconomic impacts were not an allegation in the petition. In addition, previous environmental impact statements have considered the possible socioeconomic impacts of coal mining on the region. Thus, the evaluation of the Tongue River unsuitability petition has not involved original analysis of socioeconomic impacts; rather, as stated in the April 1981 notice, it has involved incorporation by reference of already available material. See also the "Revisions to Chapter II of the Draft Document" section in chapter II.

17 Your comment is noted. The classification was not mentioned until chapter IV of the draft document because it seemed more appropriate to not separate the classification from the allegation. In any case, chapter I would not have been the place to insert baseline information given the organization of the draft document.

DSL and OSM have refined the effects of changed water quality on the current and projected uses of the water in the petition area. Please refer to chapter II of this document.

18 Page I-7 - It is acknowledged that some of the studies and analyses were still underway at the time the PED was published. The public will not have had the opportunity to review and comment on substantive portions of the evaluation. Extreme care must be utilized in the final PED to identify those areas and conclusions that have not been publicly reviewed and critiqued by petitioners and/or intervenors.

18 DSL and OSM are faced with severe time constraints, relative to the petition process. These constraints control both the decision and public input. We have done as much as possible to provide as much information as possible to the public within these timeframes. It should also be noted that there is no legal requirement to provide any petition analysis for public review prior to the final decision.

19 Page I-10 - Although monitoring and enforcement can sometimes identify and sometimes mitigate adverse impacts of mining, the petition process is expressly designed to prevent those adverse impacts from occurring in the first place. This preventive action is linked to clearly identified values in the statute. The last sentence on this page seems irrelevant to the issues raised by the petition.

19 The petition process is not designed to prevent adverse impacts. It was designed as a planning tool, whereby certain lands meeting certain criteria could be designated as unsuitable for mining.

20 Page II-8 - We note that the Tullock Member aquifer wells in the Decker-Birney area are very deep. The economic viability of substituting 1,200 foot wells for alluvial or shallow Tongue River Members aquifer wells for agricultural, domestic, or municipal uses is highly dubious. Table II-4 is very general in nature and fails to provide specific enough information on the local aquifers to assess the viability of substituting deeper aquifers for such uses, as is subsequently alluded to in the document. It can be reasonably assumed that in many, if not most, cases, for a variety of reasons, such substitution is not a feasible alternative.

20 Although the use of water from the alluvium and from the Tongue River Member is much more common than use of water from deeper aquifers, these deeper aquifers are in use in the petition area (Slagle and Stimpson, 1979). However, DSL and OSM agree that in some areas (due to many factors), the use of the deeper aquifers is not a viable alternative, and, if necessary, an alternative water source would have to be located prior to mining.

21 Page II-14 - We note that in the context of describing soils in the area, the document describes shallow soils as 20 inches or less. In Section IV the issue of shallow soils is dealt with more extensively. If available, we believe it pertinent to compare the extent of shallow soils in the petition area with other mining areas in the Montana Powder River Basin. (See Russell Boulding Table 1)

21 Comparison of the extent of shallow soils in the petition area with the extent of such soils in other mining areas in the Montana Powder River Basin is not necessary to evaluate the allegation raised. Therefore, and because of the stringent time constraints of the petition process, such comparison was not made. The section evaluating shallow soils has been expanded in chapter II.

22 Page II-16 - The PED states that "many ranchers have leased... while others have been opposed to mining." This statement is biased. It is a brief allusion to a subject that could, and has, been the object of large treatises. It is a tremendously complex subject, and where treated as superficially as this should strive for accuracy. "Some ranchers have leased and many others have been opposed to coal mining," would be the logical conclusion from the hearings in Ashland. The text should be changed to read: "Some ranchers have leased...and some are opposed to mining."

22 Your comment is noted. It was not the intent of the draft document to be a social evaluation. Simply, some ranchers within the petition area favor coal mining; others do not. Some have leased their coal; others do not wish to. Some categories overlap.

23 Page II-16 - The BLM's analysis of social and economic impacts in the 1981 Powder River Coal Lease Sale EIS is woefully inadequate and inaccurate and should not even be referenced here. We are enclosing a copy of comments on that document from an official of Broadus and the Powder River County Planning Board (Exhibit 3) to illustrate some of the problems with the EIS.

23 In the context of the draft document, the BLM analysis was cited as one of many analyses which contain pertinent information with regard to baseline conditions. No one citation was intended to be a complete analysis in and of itself. Nor was it the intent of the draft document to evaluate problems, or the lack thereof, with the 1982 Powder River coal lease sale environmental impact statement (1981).

24 Page II-16 (cont.) [illegible] with [illegible] tional designation [illegible] to [illegible] that the [illegible] presents a host of exceptionally difficult [illegible] problems if mining should occur. Not only is the [illegible] for handling rapid growth (hospitals, schools, [illegible] treatment) essentially non-existent, but the capacities of local institutions to contend with this are seriously impaired. For example, neither Ashland nor Birney is incorporated. (Please refer to the statement of sociologist [illegible] for more detailed treatment of this concern.)

25 Page II-17 - At the hearings, Charlie [illegible], [illegible] the Northern Cheyenne Elk Society, a position of great respect and stature in traditional Cheyenne society and culture, spoke of lands within the petition area that sustain herbs important to sacred ceremonies. This should be investigated and incorporated into the final PED.

Page III-8 - This is as good a place as any to point out a problem with the PED analysis. The document repeatedly refers to impacts on a nonexistent railroad and yet, [illegible] as consistently, neglects to point out the beneficial and positive result for agriculture, all the way to Miles City, if that railroad is not built. The railroad would cut a long swath through the most productive agricultural land in the area in its proposed route to Miles City. The economics of grade and curvature dictate the necessity of such a course, according to railroad planners. Its course disrupts integral agricultural units, and large and expensive irrigation projects. It cuts through the Fort Keogh USDA range station disrupting research entailing years of work and a huge public investment in agricultural productivity in the Northern Great Plains.

26 The land taken by the railroad is only a small part of the lands adversely affected by the right-of-way which will additionally destroy essential drainage patterns of productive meadows adjacent to the grade. The management of livestock will also be seriously impaired as the railroad blocks cattle from water supplies and disrupts grazing areas of integral importance to the individual agricultural unit. In some cases the disruption would be sufficient to destroy the economic viability of the operation. In any case, every farm or ranch crossed will suffer losses in productivity and land value that cannot be recompensed over the long term.

The PED must incorporate the beneficial impacts to agriculture of not building the railroad, as long as it incorporates the prospect of precluding the railroad's construction as an impact of a designation decision. This factor is also pertinent to consideration under the discretionary authority to protect the renewable resource land values by means of the unsuitability designation.

24 Your comments are noted. The intent of the draft document will be analyze the allegations of the petition. A host of difficult problems are present for all communities faced with a transition from [illegible] agricultural character to that of a mining town. These problems have been addressed in previous environmental impact statements and in numerous studies. See page II-16 of the draft document.

25 Thank you for your opinion. The agencies are pursuing the identification of these herbs; however, since no known threatened or endangered species occur in the area it is unlikely that these herbs occur only in the petition area or only over recoverable coal.

26 Your comments are noted. Whether impacts would ultimately be positive for agriculture or positive for industry cannot be determined. The ICC anticipates publication of an environmental impact statement on the proposed railroad in the spring of 1982.

27 Page III-8 - We note in the discussion on underground mining that the PED states such mining is not economical in the petition area. It is worth mentioning here merely to illustrate that such a conclusion has been reached with respect to one form of mining in the petition area. We feel that the same must be said for surface mining in the petition area, for different reasons, as detailed in our earlier comments and in those of Russell Boulding and Richard Opper.

28 Page III-10 - The recommended alternative for the 1982 federal coal lease sale in the Powder River region includes 376.8 million tons, not 621 million tons mentioned in the PED. It should be noted that the current lease target of 1.5 billion tons is double the original 776 million tons, and approximates the Dept. of energy's highest possible coal demand scenario for Powder River Basin coal in 1995. (Please refer to Russell Boulding's assessment of the DOE 1995 production goals.) When preparing the final PED, this section should include a summary of the Office of Technology Assessment's analysis of production potential from existing federal leases in the Powder River Basin in order to put the new federal lease targets in proper perspective.

29 Page IV-4 - The PED acknowledges the unique recharge characteristics of the petition area relative to the Tongue River. The petition area represents the only reach of the river below its headwaters that consistently records a gain in streamflow. That characteristic is important to the decision to designate the area as unsuitable. The PED fails, however, to recognize this characteristic in reference to the water quality impacts of mining, particularly during low flows.

30 Page IV-4 - Petitioners acknowledge that some groundwater in the area is "barely adequate for some domestic and agricultural uses." That point underscores the importance of not allowing further degradation.

31 Page III-9 - Table III-4 should list the sodium content of area coals. Sodium levels are a vital factor in considering the relative marketability of area coals, and hence the economic viability of reclaiming petition area lands.

32 Page III-10 - This section should assess the available unused capacity in the Montana and Wyoming Powder River Basin. (Please refer to Wallace McRae hearing statement regarding 70 million tons of excess capacity.)

33 Page IV-17 - As mentioned in our preliminary comments, the PED should incorporate the findings of recharged municipal and industrial withdrawals. Also, please refer to Virginia Sprague's comments on the impacts of mining on groundwater outside the [illegible]

27 Your comments are noted. Please see the responses to comments 55 through 71 of this letter.

28 A review of both the tract profiles and the draft document reveal the use of two different assumptions in the calculation of coal reserves. Thus, both number are correct. The total Federal reserves should be and are different in both cases. The BLM used a maximum 6.1:1 stripping ratio where the DSL and OSM chose to use a standard USGS definition of maximum 6.5:1 stripping ratio for defining the limit of moderately recoverable reserves. These assumptions were set forth at the front of the respective discussions in the respective documents.

The analysis was conducted using the best information available. If the national demand for coal values used in the model were lowered, coal from the petition area, under either scenario, would probably not be part of the optimal solution for the water-quality model. On the other hand, the model does consider the possible expansion of production from existing mines.

29 The internal structure of the water-quality model does take into account recharge rates in the petition area; however, the comment does provide additional perspective on the petition area.

30 Your comment is noted.

31 See the response to comment 59 of this letter.

32 It is acknowledged that there is available unused capacity for coal production in the northern Powder River Basin.

33 Please see chapter II.

34 Page IV-23 - The PED shows no evidence that BLM tract profiles were included in the soils review process. (See Russell Boulding and Richard Opper statements.) The PED should incorporate Boulding's Table I into this section.

34 See the response to comment 6 of this letter.

35 Page V-4 - Another option merits listing under "Conditional Designation of Unsuitability." That is, designate as unsuitable areas where local impacts on groundwater and alluvial water will result in the long term loss or reduction of productivity of water supply and of food or fiber products. We do not advocate that option. The evidence clearly mandates a designation of the entire area. However, we feel that this conditional option should be listed with the other conditional options.

35 Your comment is noted. See chapter V.

LIST OF ACCOMPANYING EXHIBITS AND STATEMENTS

Exhibit 1: "Instability of Contoured Surface-Mined Landscapes in the Northern Great Plains: Causes and Implications" by Gerald H. Groenewold and Bernd W. Rehm.

Exhibit 2: Cities Service comments on "Powder River Resource Area Management Framework Plan Amendments,": excerpt from "Final", June 1980.

Exhibit 3: Comments RE: Powder River Basin Draft EIS by Nolan J. Beach, Town of Broadus Clerk-Treasurer, Powder River County Planning Board, Town Building Official. (August, 1981)

Petitioners' Memorandum of Law: by James A. Patten

J. Russell Boulding hearing statement and supplemental material.

Richard Opper supplemental statement to hearing statement

Fred M. Sandoval, Statement on Principal Soil Limitations: Salinity - Sodicity - Boron, Re: Petition Area NPRC

Pat Jobes, Statement for the Tongue River Unsuitability Petition Record.

Charles Andrews written statement (arriving under separate cover).

NPRC EXHIBIT 1

Adequate Reclamation of Mined Lands? - Symposium,
Soil Conservation Soc. of Amer. and WRCC-21,
Billings, MT, March 26-27, 1980

INSTABILITY OF CONTOURED SURFACE-MINED LANDSCAPES IN THE NORTHERN GREAT PLAINS: CAUSES AND IMPLICATIONS

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Abstract

Reclamation of surface-mined landscapes is commonly defined only in terms of biological productivity. Other critical concerns associated with surface mining include the long-term quality of groundwater and stability of the postmining landscape. Meaningful reclamation design must address all these concerns. Reconnaissance of postmining landscapes indicates that three types of instability occur in these settings. These include: area-wide settling, localized collapse, and piping. Area-wide settling is most pronounced during the first year after contouring but appears to cause only minimal disruption. Large scale collapse develops only in precontouring valley areas where frozen materials are contoured with a dozer. Although severe in some settings, development typically ends within one year. Piping appears to be a severe and long-term problem in some settings. Piping usually begins soon after contouring ceases and may continue for several years. In some postmining landscapes, piping has only started to develop after as much as five years of apparent stability. Piping is controlled by a combination of physical and chemical conditions in the spoil. A key factor is the presence of highly dispersive materials in the near surface.

The design of a stable postmining landscape requires the integration of several critical factors. These include: 1) detailed knowledge of the distribution of overburden materials with emphasis upon the delineation of highly sodic sediments; 2) proper equipment selection; and 3) consideration of climatic factors. For reclamation to be successful, it must consider the entire landscape, not merely the soil zone. Any approach short of this will lead, at best, to temporary solutions.

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36

DSL and OSM are concerned about the types of problems highlighted. However, beyond the response to comment 4 of this letter (which see), responses to the specific portions of Groenwald's paper highlighted in the exhibit have not been made because they were not petition allegations.

The proposed expansion of towns, construction of power lines, and construction of ponds, lagoons, and other facilities and structures related to power plants on areas of spoils requires a knowledge of the geotechnical characteristics of these materials.

The concepts presented here are largely the result of research at the Indian Head and Center Mines in west-central North Dakota (Fig. 1). Extensive studies of the geologic, hydrogeologic, and geochemical aspects of reclamation at the Indian Head and Center Mines have been ongoing since 1974 and 1976 respectively. Studies of instability phenomena have been ongoing at Indian Head since 1975; at Center since 1979. Some results of these various studies can be found in Groenewold (1979), Groenewold and Bailey (1979), Groenewold et al. (1979), Moran et al. (1976, 1978), and Winczewski (1977). Because of the short period of observation at the Center Mine (six months), most of the following discussion will be based upon data from the Indian Head site.

The North Dakota study sites are representative of the geologic, hydrogeologic, geochemical, and climatic conditions found in most surface coal mining areas in the Northern Great Plains. Mining at both sites utilizes a walking dragline to remove overburden and dozers and pan scrapers to recontour spoils. It is felt, therefore, that the concepts presented here have wide application to reclamation design throughout the arid to semi-arid regions of western North America.

[illegible]

[illegible] 15 months after contouring [illegible] Differential subsidence [illegible] and piping failures are the most [illegible] Differential subsidence features develop [illegible] after [illegible] of contouring. These features [illegible] elliptic [illegible] in shape reaching a maximum length of 50 feet [illegible] 10 feet (3 m) in depth. Development generally ceases within [illegible] months. Piping, on the other hand, may develop soon after [illegible] but may not appear until several years later. [illegible] feature [illegible] appear after a rainstorm as small openings through the topsoil and underlying materials. Surface runoff from snowmelt and rainfall drains into and enlarges the openings, carrying away topsoil and spoil materials. Piping features have been observed as large as 10 feet (3 m) in diameter. They are commonly 2 to 3 feet (0.6 to 1 m) in diameter.

Methods

Instability is a reflection of [illegible] a landscape. Each landscape, as previously discussed, consists of [illegible] interrelated variables. In the postmining setting these variables can be grouped into two general categories. These include 1) variables dependent upon the original physical and chemical characteristics of the redistributed materials, and 2) variables dependent upon methods and equipment used in stripping and contouring operations as well as time-of-year when these operations occurred.

Determination of the significance of each of these variables as a contributing factor to instability requires the instrumentation of contoured landscapes in which all critical variables are known. Although the following discussion emphasizes the Indian Head site, the approach to instrumentation and monitoring as well as baseline data availability of study sites at both mines is essentially identical.

The Indian Head study site encompasses an area of about 40 acres (16 ha). This site had previously been monitored in detail during contouring operations. Detailed topographic and materials maps of the site prior to contouring, as well as seasonal equipment variables related to the contouring phase had been delineated (Fig. 2). Data on premining characteristics of the overburden were also available. The site encompasses a complete range of precontouring dragline-controlled morphological variables, ranging from valleys to ridges with a maximum relief of approximately 80 feet (25 m). The overburden in the area of the study site was predominantly interbedded Tertiary silt and clay. Contouring had occurred over an approximate 12-month period; thus a full range of climatic variables was represented. In addition two methods of contouring were used at the site. A portion had been contoured with a scraper; the remainder was contoured with a dozer (Fig. 2).

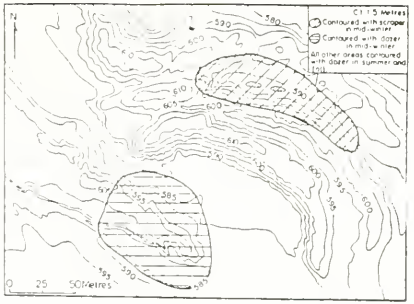


Figure 2. Precontouring topography of the Indian Head study site, delineating major equipment and seasonal variables during contouring.

Instrumentation of the site began approximately one year after contouring of the site was completed. The instrumentation was designed to monitor surface movements of the materials and hydrologic conditions within the landscape. Forty-five concrete survey markers were placed in the study area (Fig. 3). The locations of the markers were chosen in such a way as to maximize the monitoring of sites where significant variables occurred within the spoils. The markers were surveyed on a monthly basis. Both horizontal and vertical displacements were determined.

Fourty-four piezometers were installed at 23 locations in the site. Each piezometer is screened in one of three stratigraphic positions--the base of the spoils (which varies from 25 feet (8 m) to greater than 80 feet (25 m) in thickness), 15 feet (5 m) above the base of the spoils, and in an unmined lignite bed which lies about 30 feet (10 m) below the base of the spoils. As with the survey markers, the locations of the piezometers were chosen according to significant variables within the spoils that might affect or control spoil water movement and, in turn, spoil stability. The water levels in the piezometers are monitored on a monthly basis. Slug tests of those wells having a sufficient water column were performed to determine the hydraulic conductivities of the spoils in various settings. Gamma-gamma and gamma-density geophysical logs were obtained for all piezometer test holes. The gamma-density logs proved to be particularly useful in delineating blocky and poorly consolidated zones in the spoils.

The data from the 45 survey markers are highly site specific and record the reaction of a very small fraction of the surface to subsurface inequilibrium. Thus, periodic field observations of the site were performed to delineate and document the development of surface instability features between survey points.

Figure 3. Location of survey markers in the Indian Head study site, superimposed on precontouring topography.

Two hundred and twelve 3 in (7.62 cm) diameter, thin-wall tube samples were obtained through six borings distributed over the study site. The six borings were distributed so as to recover samples representing a wide range of spoil handling conditions used at the study site. Two borings were made in precontouring spoil ridges that had been placed by dragline and recontoured by dozer in early winter. Two borings were made in precontouring spoil valleys that were refilled by scraper in mid-winter. Two borings were made in precontouring spoil valleys, each near the juncture of adjacent spoil banks, which were recontoured by dozer in early winter.

Results

Survey monitoring of the 45 permanent markers indicate very little movement. Maximum vertical displacement has not exceeded 5 inches (13 cm) at any of the markers. No significant horizontal displacement has been noted. Initial area-wide settling of the study site undoubtedly occurred prior to instrumentation. Observed area-wide settlement of contoured spoils at other locations in the Indian Head Mine and other mines has been typically on the order of 1.5 to 3 feet (0.5 to 1 m). This settling usually occurs within 12 to 15 months of the completion of contouring activities and is most pronounced in areas of dozer contouring. Instrumentation at the Indian Head study site was not in place until about one year after the completion of contouring. Thus, all significant area-wide settlement probably occurred prior to instrumentation.

This conclusion is substantiated by preliminary survey data from test sites at the Center Mine. The Center study sites were instrumented within 30 to 60 days of completion of contouring. Settlement during the initial period of observation at Center was particularly significant in areas contoured in mid-winter with a dozer. In these sites, initial area-wide settlement has commonly ranged from 0.5 to 2 feet (0.15 to 0.6 m) in the first six months of monitoring. During the same period, settlement in summer-dozer and mid-winter scraper-contoured areas at Center has been minimal (less than 0.25 feet (0.07 m)).

Detailed field observation and mapping of the Indian Head study site have been extremely useful in delineating and monitoring the development of collapse and piping features. Figure 4 shows the location of these features in the study site. Of interest is the concentration of piping in a generally east-west line which parallels the southern edge of the scraper-contoured portion of the site (Fig. 4). The scraper-contoured area is totally devoid of any indications of subsidence; whereas, these features are scattered throughout the dozer-contoured area. Numerous, large (greater than 6 feet (2 m) in diameter) collapse features formed in precontouring valley areas where frozen blocky spoils were contoured in mid-winter (Fig. 4). These features have not shown any growth since the initial period of observation which began about 12 months after contouring.

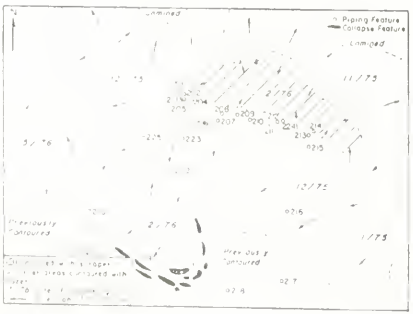


Figure 4. Piping and collapse features

Progressive [illegible] over precontouring [illegible] in mid-winter. Similar [illegible] at Center are extremely [illegible] at Center are also devoid of [illegible] Late, piping has not been observed in the Center study [illegible].

[illegible] at Indian Head indicates that the base of the spoils [illegible] about 70% of the study site. Preliminary [illegible] Center [illegible] a similar condition in the base of the spoils. [illegible] data from both mines indicates that the study sites are [illegible] groundwater recharge. The movement of subsurface waters and [illegible] characteristics in the base of the spoils areas in western North America have been addressed by various researchers (Alberta Environment [illegible], Davis and Rechard 1977, Groenewold and Bailey 1979, Rahn 1976, Van Voast et al. 1978). Hydraulic conductivity data from the basal portion of spoils in these areas show a wide range of values. [illegible] values from spoils in Montana, Wyoming, and North Dakota range from 10^{-5} to 10^{-9} m/sec (Davis and Rechard 1977, Groenewold and Bailey 1979, [illegible] et al. 1978). Such a range of values seems reasonable given the high degree of structural, morphological, and textural variability within a given body of spoils.

The base of the spoils is of interest because it corresponds to the position of the coal bed which commonly represents a significant aquifer in the premining landscape. It also constitutes the most likely avenue for discharge of water entering through piping features. Thus, the long-term [illegible] characteristics of the base of the spoils may be a key factor in the stability of postmining landscapes. This horizon is often characterized by concentrations of blocky material, particularly in the area between precontouring spoils ridges (Winczewski 1977). This observation is substantiated by Van Voast et al. (1978) who have determined that the basal portions of spoils at Colstrip and Decker Mines in Montana are characterized by greater average hydraulic conductivities than in other positions within the spoils. Their research also indicates that the mine spoils at Decker and Colstrip sites presently are at least as conductive of groundwater as the coal beds. Unfortunately, no data are available relating hydraulic conductivity values in the spoils at those sites to precontouring morphology. Data regarding temporal changes are also unavailable from the Montana sites.

Such comparisons have been made at Indian Head. Eleven hydraulic conductivity values for piezometers in the base of the spoils at the Indian Head site were determined by slug testing in April 1978 (Table 1). Five values from wells located in precontouring spoil ridge areas range from 3.0×10^{-7} m/s to 4.8×10^{-9} m/s. Six values from wells located in precontouring spoil valley areas range from 4.6×10^{-5} m/s to 2.9×10^{-6} m/s indicating considerably greater variability in precontouring valley areas than in ridge areas (Table 1). All values are from areas contoured by dozer.

A second round of hydraulic conductivity testing of these piezometers was carried out in September, 1979 (Table 1). Of nine piezometers for which tests could be duplicated, seven showed a decrease in hydraulic conductivity over a period of 17 months. On the average the hydraulic conductivity decreased by one order of magnitude (mean log K_1/K_2 = -0.99).

The average increase in hydraulic conductivity of the two piezometers that showed an increase was +0.93. When the piezometers are divided into groups according to whether they are screened in precontouring valleys or ridges, two distinct sets of hydraulic conductivity values emerge. These piezometers in the precontouring valleys have a mean log $^{K}/K$ of -0.39 and a very large standard deviation of 1.47. Of the five values in this group, two indicate increased spoil hydraulic conductivity. The four piezometers in the precontouring ridges all indicate a decrease in permeability with a mean log $^{K}/K$ value of -0.78 and a standard deviation of 0.45.

These data suggest that compaction is continuing within the base of the spoils, particularly within the precontouring ridge areas. In contrast, these data may suggest that groundwater movement is concentrating, and enlargement of voids is occurring, in certain portions of the precontouring valley areas as indicated by increasing K-values in two piezometers screened in those locations.

Water levels in wells show some indication of decreased saturation in locations of precontouring spoil ridges as opposed to precontouring spoil valleys. This may suggest preferential movement of water in the base of the spoils through the generally linear pre-contouring valley areas or increased recharge in those locations. These observations are in agreement with pump test data presented by Rahn (1976) which indicate linear preferential drawdown in the area between precontouring spoil ridges at a site in Wyoming (see also Gerlach 1976).

Table 1. Hydraulic conductivity values from piezometers screened in base of spoils--Indian Head site.

[illegible]	[illegible]	K' ($^{m}/s$) [illegible] 9-79	log $^{K'}/K$
[illegible]	[illegible]	1.9×10^{-8} (-7.73)	-2.4[illegible]
[illegible]	[illegible]	1.5×10^{-7} (-6.83)	+0.[illegible]
[illegible]	1.2×10^{-8} (-7.92)	6.2×10^{-9} (-8.21)	-0.29
[illegible]	7.3×10^{-9} (-8.14)	1.4×10^{-9} (-8.85)	-0.[illegible]
[illegible]	4.5×10^{-9} (-8.32)	2.0×10^{-10} (-9.70)	-[illegible]
[illegible]	$3.[illegible] \times 10^{-[illegible]}$ (-6.[illegible])	5.2×10^{-8} (-7.28)	-0.[illegible]
[illegible]	$6.5 \times 10^{-[illegible]}$ (-[illegible])	4.0×10^{-6} (-5.40)	-1.00
[illegible]	[illegible]	Destroyed	
[illegible]	[illegible]	$1.[illegible] \times 10^{-[illegible]}$ (-6.88)	+[illegible]
[illegible]	[illegible]	1.6×10^{-9} (-8.81)	-0.2[illegible]
[illegible]	[illegible]	Low water level	

[illegible] is difficult [illegible] characteristics of the base of the [illegible] may be required to re-establish [illegible]

shear tests reached maximum deviator stress at strain levels between 9 and 12%. The only exceptions to this were two samples from a boring in the area recontoured with a scraper which did not fail until strained to about 17%. Strength test results were about equally divided between brittle type and yield type failures. Most of the yield type failures were for samples of scraper placed spoil material. This behavior is the first indication that placement method alone can influence deformation of the spoil material. The consolidation tests showed that for the most part, the spoil material is currently subjected to lower earth pressure than the maximum past overburden pressure. Of six consolidation tests performed, only one sample was found to be undergoing virgin consolidation, the other samples had overconsolidation ratios of 1.2 to 2.7.

Causes and Implications

Observation and monitoring of the North Dakota study sites indicate that the three common forms of instability--area-wide settling, localized collapse, and piping are each attributable to specific variables in the postmining landscape. These variables are dependent upon the original physical and chemical characteristics of the overburden, methods and equipment used in stripping and contouring operations, and the season when these activities occurred.

Area-wide settling is common in most postmining landscapes but appears to cause only minimal disruption. Area-wide settling generally occurs during the first year after completion of contouring. During mining and contouring operations, the redistributed overburden materials assume a volume often considerably greater than in the undisturbed state. This initial increase in volume has been estimated at 25% for mines in western North America (Van Voast 1974). Although difficult to quantify, this estimate corresponds well with observations in North Dakota mines. With time the contoured spoils settle, and approach a density similar to that which existed prior to mining. The textural characteristics of the original overburden can be expected to have a marked influence on settlement. Fine-grained (clayey) overburden commonly results in more blocky and, initially, more porous spoils than does sandy overburden. Field observations of contoured spoil areas at the Indian Head and Center sites indicate a lesser degree of settlement in areas of largely sandy spoils than in areas of clayey spoils. Equipment is also a critical factor. Settlement is significantly less in scraper-contoured areas than in dozer-contoured areas, particularly if contouring occurred in mid-winter.

Localized large-[illegible] collapse also develops soon after contouring is completed. Although [illegible] settings, development typically [illegible] within one year. Large scale collapse, as indicated by this study, develops only in precontouring valley areas where frozen materials are contoured with a [illegible] contouring of frozen spoils concentrating large [illegible] fragments in valley areas. Settlement and thawing in areas where the frozen blocky material [illegible] been concentrated apparently [illegible] this type of instability. The time involved for re-establishment [illegible] stable landscape will be dependent upon the resulting effect of [illegible] materials. [illegible] type of instability [illegible] thus largely [illegible]. In the Northern Great Plains spoils

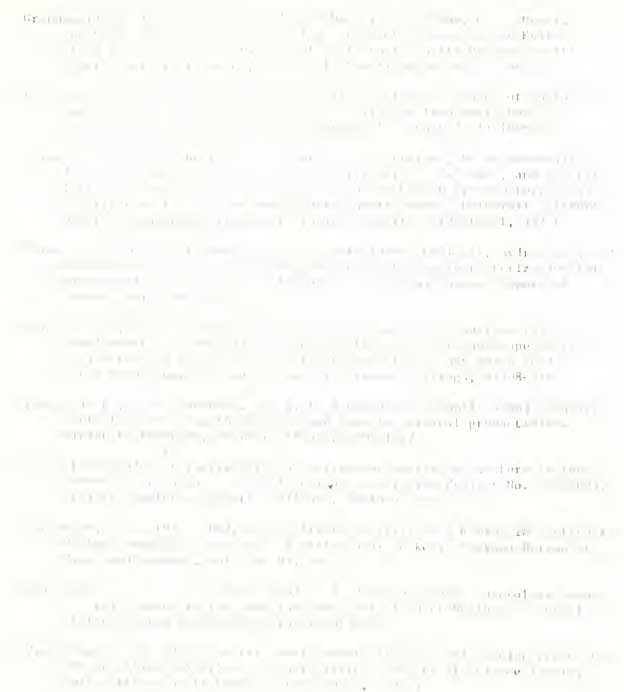
[illegible] the long-term repercussions may be severe. Localized [illegible] resulting from the burial of frozen spoil and area-wide settl[illegible] [illegible] to be significant concerns during the first year after [illegible] contouring. [illegible] of [illegible] spoil [illegible] North Ameri[illegible] been observed for [illegible] not shown any indication of decreasing in severity after [illegible] of time. Even more significant is the initial appearance of piping in "reclaimed" areas after as much as five [illegible]. [illegible] that piping may [illegible] long-term problem in many postmining settings.

The foregoing discussion has demonstrated the necessity for total landscape design if meaningful reclamation is to be achieved in surface-mined areas of the Northern Great Plains. Implications with regard to the biological and groundwater aspects of reclamation design are significant.

The chemical evolution of subsurface water in most settings in the Northern Great Plains is largely determined by geochemical processes active within the upper 7 to 10 feet (2 to 3 m) of the landscape, the rooting zone of most plants. These processes determine not only the quality of water which reaches the water table, but also the quality of pore water in the rooting zone. Thus, both long-term biological productivity and groundwater quality are a function of these near-surface processes (Groenewold et al. 1979, Moran et al. 1978). Key processes affecting groundwater quality in both premining and postmining settings involve the generation of sulfate by pyrite oxidation and sodium by cation exchange. The simple replacement of topsoil and "second lift" materials without regard for the physical and chemical characteristics of materials below the soil zone and without consideration of equipment and climatic variables is, at best, a temporary and elementary approach to reclamation.

The shortsightedness of the "topsoil-replacement-only" approach to reclamation, as is required by the majority of existing state and federal regulations, is demonstrated by recent research by Power et al. (1979). Testplots consisting of variable thicknesses of topsoil and subsoil over sodic ([illegible]) spoil, were constructed to determine the amount of soil material required for successful revegetation. Total thicknesses of soil materials varied from [illegible] to [illegible] cm. Testplot data collected over a three-year period indicate that in all cases, sodium from the underlying spoils migrated upward into the [illegible] material. The study found that in a semi-arid climate sodium may migrate to within 15 cm of the soil surface within a few years. Correspondingly, [illegible] was typically thickest the first year of the test and showed a consistent decrease in following years.

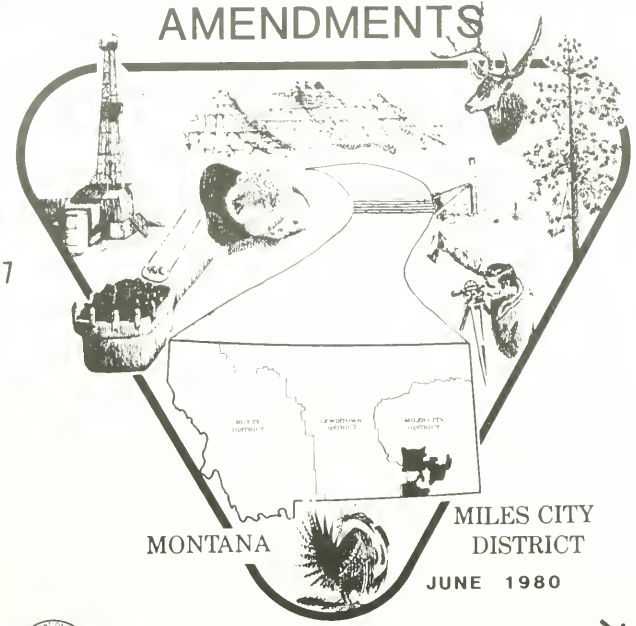
[illegible] demonstrates the need for an understanding of the entire landscape. [illegible] it demonstrates the need for a [illegible] of [illegible]-grained [illegible] materials from the geochemically active [illegible] zone. It [illegible] that any technique which increases infiltration below the soil zone in areas of highly sodic spoil will result in a biologically non-productive landscape. In this respect, selective handling of sandy overburden for placement below the soil may be useful in some settings. Power et al. (1979) suggest smoothing the spoils [illegible] lowest [illegible] gradient possible thereby [illegible] runoff and increasing infiltration.



NPRC EXHIBIT 2

POWDER RIVER RESOURCE AREA

MANAGEMENT FRAMEWORK PLAN AMENDMENTS



MONTANA

MILES CITY DISTRICT

JUNE 1980

FINAL

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

37

37 This information is noted.

COMMENTS [illegible] ON
THE POWDER RIVER AREA MANAGEMENT FRAMEWORK PLAN
PLATE REPORT OF 1979

Cities Service Company wishes to thank the Bureau of Land Management for the opportunity to present [illegible] evening. In making these remarks we do not [illegible] the efforts of the Bureau to make available [illegible] last federal coal deposits existing in the State of Montana. Cities Service wholeheartedly supports your efforts in this [illegible]. Cities Service is equally committed to the rational and [illegible] development of coal reserves as a partial solution to this nation's pressing energy needs.

Since management's decision in 1979 [illegible] coal production, Cities Service has followed [illegible] your efforts and has carefully reviewed the Powder River Resource Area Management Framework Plan Update Report of July 1979. Nevertheless, Cities Service respectfully requests that the Bureau withdraw the Ashland(Decker-Birney and Otter Creek Coal Fields from consideration for leasing in 1982. The reasons for this request will be specified later.

This request is made with the understanding that the Bureau has already begun the inventory phase of a new coal activity plan that may enlarge the existing [illegible] Fields, and may make additional federal [illegible] available for a 1986 lease sale. These additional federal [illegible] would be adjacent to federal reserves being [illegible] in 1982.

The [illegible] of Cities [illegible] a delay [illegible] leasing of the Otter Creek and Ashland [illegible] at [illegible] to frustrate or halt the Federal coal leasing program. Rather, it is [illegible] purpose to [illegible] the leasing of Federal coal [illegible] be [illegible] efficient manner.

The [illegible] Cities Service's request for a delay [illegible] are as follows:

1. Two Federal coal [illegible] in 1982 and the other in 1986 is impractical and uneconomical. Cities Service Company is the dominant private holder of surface and coal in the Otter Creek and Ashland coal fields area. In Townships 3[illegible], 4[illegible] and [illegible] Range 45E, Cities has surface and/or coal interests in 28,400 acres. In the Ashland Decker-Birney coal field, as delineated in the Management Framework Plan, Cities controls [illegible]% of the surface over the Federal coal and [illegible]% of the total surface. Cities is currently negotiating for control of private coal underlying approximately 1,8[illegible] acres in the Ashland field.

In the Otter Creek coal field Cities controls 64% of the surface over the Federal coal and 76% of the total surface. Cities is currently negotiating for control of private coal underlying approximately 3,[illegible] acres in the Otter Creek field. Furthermore, Cities possesses an approximately equal [illegible] position in properties directly adjacent to the Management Framework Plan delineated Otter Creek and Ashland coal fields.

Consequently, Cities has expected to [illegible] the fe[illegible] these two fields when the lease sales were held.

Cities, however, did not expect the lease sales to [illegible] in 1982, nor did it expect that the leasing program would be based on the Management Framework Plan developed in the mid 70's which utilized incomplete and outdated reserve data. Cities expected that the new Coal Resource Occurrence Maps would be developed in time to be used for the delineation of the coal fields. These maps, which are just now beginning to become available, are showing and will continue to show additional high and moderate development potential coal outside the presently delineated fields. Cities recognizes that the regulations allow leasing to go forward with best available data if the [illegible] CDP maps are not available. However, because of the extremely poor and incomplete data in these particular areas, initial "piecemeal" leasing on the basis of the old, incomplete data will result in far less than the optimum development of the coal resource.

If leasing does go forward with this old data, Cities or any other bidder is presented with a dilemma. Should Cities Service Company bid at the 1982 sale realizing that the federal coal reserves available for leasing are not sufficient to support the logical development of the area and hope the required additional federal reserves will become available for leasing in 1986? With this scenario should Cities then struggle with

the ten [illegible] year due diligence requirement when, in 1982, [illegible] a part of the federal reserves in the area are available for leasing. Or should Cities simply not bid at all at the 1982 sale and await for the full delineation and determination of the availability of the adjacent federal reserves? This dilemma, despite its substantial holdings in the area, certainly dampens Cities Service Company's enthusiasm to participate in the 1982 bidding process. And, we believe the necessary consequences of this piecemeal leasing process will be a diminished interest in the 1982 sale. A more rational plan would be to delay the 1982 sale until further delineations with respect to the additional reserves have been completed.

2. It is necessary that the Bureau of Land Management obtain the surface owner consent of Cities Service Company before making these lands in the Otter Creek and Ashland Coal Fields available for federal leasing.

Section 714 [illegible] of the Surface Mining Control and Reclamation Act provides, in part: "The Secretary shall not enter into any lease of Federal coal deposits until the surface owner has given written consent to enter and commence surface mining operations and the Secretary has obtained evidence of such consent."

This requirement also exists at Section 1427.1 of the July 1[illegible], 1979 Rules and Regulations implementing the Federal Coal Management Program. An affiliated company of Cities Service

[illegible]

leasing federal coal underlying surface controlled by Cities, that it must obtain Cities' consent. Otherwise, the statutory intent of §714(a) is both frustrated and ignored. The failure of the Bureau to seek Cities Service's preference in the leasing activity thus by-passes one of the required procedural steps.

3. The 1982 Lease Sale is not in accordance with the Rules and Regulations of the Federal Land Policy Management Act.

The majority of the planning which is the basis of the 1982 lease sale occurred prior to the adoption of the rules and regulations implementing the Federal Coal Management Program, and prior to the passage of the Federal Surface Mining Control and Reclamation Act. Consequently, the process leading to the Management Framework Plan and the 1982 lease sale is flawed in that it omits numerous procedures and safeguards that exist under the current statutes and regulations (e.g. detailed statement required by 30 U.S.C. §1272(d)).

However, the proposed 1986 lease sale will be the culmination of a process which complies entirely with the current regulatory scheme, which further supports Cities' position that the Otter Creek and Ashland Coal Fields should be withdrawn from the 1982 lease sale and made available in 1986.

Cities Service is also aware that the notice setting this hearing stated that the coal field delineation was not open for discussion. However, it is Cities Service's position that the

[illegible] and excluded privately [illegible] statutory authority, and excluded federal coal on the basis of unsound scientific data, and inadequate environmental and land use planning data as required by FLPMA, thus preventing an objective decision being made on the field delineation. If this public hearing is not the proper time for questioning the factors considered and the methods used in the field delineation then Cities Service would ask at what point such a challenge can be made to satisfy procedural due process?

4. Coal gasification and liquefaction require substantial coal reserves to justify the required economic investment.

There is one further compelling reason why Cities Service would like to see the Otter Creek and Ashland Coal Fields (as currently delineated) expanded to include additional federal coal reserves and leasing postponed until at least 1986. This reason is based upon Cities Service's belief that this area will be capable of producing sufficient coal to sustain a coal gasification and/or liquefaction facility.

As you are aware, the government is currently spending millions of dollars to support research in synfuels production [illegible] available sufficient [illegible] production. Because of the [illegible] required to construct and operate [illegible] sufficient coal reserves [illegible] operation of such facilities.

In 1976, Cities Service Gas Exploration Company filed with the Bureau a document which nominated tracts in this area, both within and adjacent to the Ashland and Otter Creek Fields, for leasing for coal gasification purposes. Cities Service Company has not eliminated the possibility of such a facility but recommends postponing the proposed 1982 leasing date until at least 1986 to allow further advancements to be made in synfuels research and to allow additional coal reserves to be attributed to these coal fields. Such a position by the Bureau would help insure a sufficient coal reserve availability for possible utilization of advanced synfuel technology and would be consistent with government policy.

In closing, Cities Service realizes that its request to delay leasing in the Otter Creek and Ashland coal fields until 1986 should not frustrate the federal leasing process. Nevertheless, Cities Service feels that, in light of its property position in this area, its recommendations should have some bearing on the federal decision regarding leasing. Otherwise, the policies of maximum utilization of a federal coal reserve and realization of the fair market value thereof may not be realized.

For the above reasons, Cities Service Company respectfully requests that the Bureau withdraw the Otter Creek and Ashland (Decker-Birney) Coal Fields from further consideration for leasing in 1982 and expand the delineation of these coal fields to include additional adjacent coal with a target leasing date of 1986.

NPRC EXHIBIT 3

Town of Broadus

Box 647 Broadus, Montana 59317 Ph. 406-436-2409

RE: Powder River Basin
Draft Environmental Impact Statement
1792-FR EIS

It is not my intention to become an "expert" and nit pick the DEIS, however since several people who are experts in their field will be reading this document, it is my intention to have certain facts brought to light or expanded from those now included in the sociology and economic areas.

Page 14, number 9 (Assumptions). The time frame is acceptable provided all goes well under the Montana permit system, however this time frame has not been incorporated into the alternatives nor has attention been given to "lead time" in regard to revenues and capital expenditures.

Page 62, (Sociology). Community services and facilities are restricted to personnel services. Other community services are defined as water supply, waste-water and solid waste disposal. Here again, little attention has been given to these items which require lead time to develop. Teachers, Doctors, Dentists, Law Enforcement etc. will be needed but no mention is made of where they will conduct their classes, practices etc. and within what facilities.

Page 63, (Economics). "40% of any resulting population increase is expected to reside in Powder River County" would have been sufficient. The word "only" preceding it causes the reader to ignore the facts shown on the tables. Table 4-11 totals 4,723 projected population. Table 4-10 totals 4,005 projected employment. Table 4-9 totals 2,150 dwelling units (projected). Table 3-7 shows 2,523 existing population and 1245 existing employment. Table 3-6 shows 1,123 existing dwelling units. Assuming that you mean total population and not additional population on table 4-11 it means that there will be an 87% increase in population, 222% increase in employment and a 91% increase in dwelling units. Now those are pretty overwhelming figures when you realize that not one dollar is available prior to the actual production of coal. Naturally, Rosebud County statistics are worse.

I am convinced that the key to the inequities of the socio-economics of this particular DEIS are summed up in the first paragraph of ECONOMICS/Montana on Page 63, which states:

> Montana counties, schools or communities do not receive a percentage of the severance tax on mineral production from the state. However, in an effort to tie potential benefits to potential costs in the analysis of Alternatives 2,3 and 4, additional revenues to local entities were estimated on the basis of coal production.

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That particular paragraph leads me to believe that the entire leasing alternatives were based on Wyoming laws. Montana counties, schools and communities do not receive a direct percentage of the severance tax on mineral production from the state. Montana counties, schools and communities also do not receive direct percentages of the federal mineral royalties. Indirect percentages are received from other federal and state activities but are restricted in use. Another interesting fact which really has not direct effect on the coal leasing is that upon full production of mineral activities, valuations increase, and several millions are expended by mineral producing counties thru a special 40 mill levy for the state school foundation program. All funds returned to counties from foundation and equalization funds are based on ANB and are not available for actual needs. Where, in all of this, can there possibly be a fiscal surplus!

Incorporated cities and towns received no direct revenues from mineral production, and are supported by real estate and portions of state gas, liquor and other miscellaneous taxes. Water, wastewater and solid waste are supported by users charges and are required by law to be self supporting. All unincorporated communities are the responsibility of their individual counties.

Page 3 has one small item which needs clarification. The four new leasing alternatives located in Powder River County are in a joint Rosebud/Powder River school district #32J. Any increase in valuation within that district will help that portion of Rosebud County. The lead time for building schools is still required as well as the money to build it.

I am in full agreement with the statement ;"Most of these impacts could be migated but only through strong community commitment and assistance from both federal and state governments."

The 1981 Powder River County Update to the Comprehensive Plan has covered many of the points just addressed. It has also referenced some state laws, mitigation strategies, and financing alternatives.

In closing, I would like to ask that the final EIS address the difference in state laws, or more specifically, the Montana laws concerning revenues and expenditures. I am particularly concerned with impacts on incorporated small towns because of the double tax structure which then must maintain.

Respectfully submitted,

Nolana J. "Lonnie" Beach
Town of Broadus Clerk-Treasurer
Powder River County Planning Board
Town Building Official

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JAMES A. PATTEN
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AREA CODE 406
252-8762

October 30, 1981

Sandi Johnson
Montana Department of State Lands
Captiol Station
Helena, Montana 59620

John Lovell
Branch of Environmental Analysis
Office of Surface Mining, Reclamation and Enforcement
Department of the Interior
1951 Constitution Avenue, N.W.
Washington, D.C. 20240

Re: Tongue River Unsuitability Petition

Dear Ms. Johnson and Mr. Lovell:

Enclosed please find a legal memorandum submitted on behalf of the petitioners in the above referenced matter.

Sincerely yours,

JAPatten

James A. Patten

JAP/jab

Enclosure

cc: Counsel of Record

STATE OF MONTANA
BEFORE THE DEPARTMENT OF STATE LANDS

UNITED STATES DEPARTMENT OF THE INTERIOR
BEFORE THE OFFICE OF SURFACE MINING,
RECLAMATION, AND ENFORCEMENT

IN RE THE MATTER OF DESIGNATING CERTAIN LANDS IN ROSEBUD & POWDER RIVER COUNTIES, MONTANA, AS UNSUITABLE FOR SURFACE COAL MINING OPERATIONS.)	))))	PETITIONERS' MEMORANDUM OF LAW

INTRODUCTION

This memorandum is submitted on behalf of the Petitioners Northern Plains Resource Council, Tongue River Agriculture Protection Association, Rosebud Protective Association and Tri-County Ranchers' Association (hereinafter collectively referred to as "NPRC"). Interveners to this proceeding have raised several legal arguments in opposition to the designation of the petition area as unsuitable. This memorandum responds to those legal arguments.

Formal petitions to intervene asserting such legal arguments have been filed by Wesco Resources, Marcus L. Nance, Jay L. Nance, Susann W. Boedecker, Nance Cattle Company, Brown Cattle Company, Arthur F. Hayes Nancy B. Hayes, Peabody Coal Company, Burlington Northern, Montco, and Cities Service. These interveners in their petitions to intervene and in comments submitted at the

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38 Thank you for your memorandum. However, it is not the purpose of this document to address legal issues.

public hearing on NFPC petition have made the following argument:

1. An unsuitability designation will result in an unconstitutional taking of private property.
2. The interveners are exempted from any unsuitability designation because they have made substantial legal and financial commitments within the petition area.
3. The Office of Surface Mining lacks the authority to designate federal lands as unsuitable as a result of a citizen initiated petition.
4. The Office of Surface Mining and the Department of State Lands lack the authority to designate the petition area as unsuitable because the statutorily required data base and inventory have not been completed.
5. The allegations of the NFPC petition are better addressed in a site specific mine permit application review.
6. The cumulative impact of mining within the petition area is not a proper criteria on which to designate the area as unsuitable.
7. The petition area cannot be designated as unsuitable since reclamation is both technologically and economically feasible.
8. [illegible] the petition area is not [illegible] designate the petition area as unsuitable.

the unsuitability provisions of the Surface Mining Control and Reclamation Act ("SMCRA"), section 522 of SMCRA, 30 U.S.C. sec. 1272, and of the Montana Strip and Underground Mine Reclamation Act ("SUMRA"), 82-4-228 MCA. Any challenge to the regulations must be rejected on jurisdictional grounds. First, the proper forum in which to resolve a concern with the propriety of the regulations is a court of law, not an agency of the executive branch of the government. Second, as will be shown below, the regulations, at this time, cannot be properly challenged in any court since the time for doing so has long elapsed; furhtermore, a court of competent jurisdiction has reviewed the unsuitability regulations and has upheld their legality. The Office of Surface Mining ("OSM") and the Department of State Lands ("DSL") have no discretion but to review and rule upon NPRC's petition in full accordance with the regulations.

As noted above, the unsuitability regulations are, at this point, immune from legal challenge. With respect to the federal unsuitability regulations, only one court in the nation has the jurisdiction to hear and consider legal challenges that court is the Federal District Court for the District of Columbia. SMCRA sec. 526 (a)(1). Other courts have refused to hear what are in effect challenges to regulations when the relevent statute limits such challenges to the District of Columbia courts. This is true for challenges to the regulations implementing SMCRA, Union Carbide Corp. v. Andrus, 13 ERC 1481 (S.D.W.Va. 1979), as well

as for challenges to rule-making pursuant to the Clean Air Act. Fry Roofing v. EPA, 554 F.2d 885 (8th Cir. 1977); Union Electric Co. v. EPA, 427 U.S. 246 (1976); Oljata Chapter of Navaho Tribe v. Train, 515 F.2d 654 (D.C. Cir. 1975); Pacific Legal Foundation v. Costle, 14 ERC 2121 (E.D. Cal. 1980), aff'd, 627 F.2d 917 (9th Cir. 1980).

According to the weight of law, only the District of Columbia courts can entertain any challenges to the regulations. That court has, in fact, entertained such a challenge and has sustained the validity of the unsuitability regulations. In re Permanent Surface Mining Regulation Litigation, 14 ERC 1083 (D.D.C. 1980). Plainly, the unsuitability regulations are now immune from question by the interveners.

The Montana regulations are similarly immune from challenge. The Montana regulations were promulgated almost two years ago in full compliance with the Montana Administrative Procedure Act. 2-4-101 MCA et seq. The Montana regulations were accepted almost a year and a half ago when OSM approved the Montana program. 45 Fed. Reg. 21560 (April 1, 1980). The time limit in which to challenge the Montana program expired in June, 1980 as section 526(a)(1) of SMCRA requires judicial review of the federal approval of a state program to be commenced within sixty days of the program approval. Any attempted challenge beyond this sixty days deadline must be rejected for lack of jurisdiction.

It is evident then that any argument relating to the

validity of the regulations involved in the petition process is patently without merit. OSM and DSL have no discretion but to accept the regulations as lawful and to review NPRC's petition accordingly.

NPRC responds to each of the interveners' arguments as follows:

1. The unsuitability process does not result in any compensable taking of property.

Several interveners contend that should OSM and DSL designate the petition area as unsuitable, such action will constitute a taking of property requiring compensation. The argument is two-told. First, they contend an unsuitable designation will prevent private coal owners from surface mining their minerals and therfore constitutes a "taking"; second, due to the restrictions requiring the mining of "logical mining units" and the checkerboard ownership of federal coal, some interveners argue that the designation of the federal lands as unsuitable will preclude the formation of logical mining units which also constitutes a "taking." Both arguments are founded on misconceptions of constitutional law.

It should be noted that SMCRA and SUMRA are entitled to a presumption of constitutionality. Billings Properties v. Yellowstone County, 394 P.2d 182 (Mont. 1962); Zahn v. Board of Public Works, 274 U.S.325 (1927); Marblehead Land Co. v. City of Los Angeles, 47 F.2d 528 (9th Cir. 1931). This presumption of constitutionality precludes any resolution of the constitutional arguments

by officers of the executive branch. This presumption of constitutionality also means that the resolution of any alleged constitution defect of the statute, or its application, can be properly and exclusively made by the judiciary.

The unsuitability scheme is a regular and valid exercise of the federal government's proprietary powers, its interstate commerce power, and the state government's police power.

The unsuitability provisions of SUMRA were expressly enacted in the pursuant to the state's police power. Sec. [illegible] MCA. Police power is unarguably the most pervasive and least restricted power of the sovereign. Ruona v. City of Billings, 136 Mont. 554, 323 P.2d 29, 30 (1958); Queenside Hill Realty Co. v. Saxl, 328 U.S. 80, 83 (1946); Hadacheck v. Sebastian, 239 U.S. 394, [illegible] (1915). The wisdom and need for the unsuitability scheme is properly resolved by the legislature and is of no concern to the executive branch of the government. Queenside Realty [illegible] Saxl, [illegible] U.S. [illegible] of [illegible].

The [illegible] police power [illegible] to [illegible] the public health, welfare and the natural [illegible], State v. Bernhard, [illegible] Mont. [illegible], 568 P.2d 136, [illegible] (197[illegible]). [illegible] fundamental that in [illegible] of police power, the [illegible] may [illegible] the [illegible] benefit of property without creating a "taking" requiring [illegible]. Billings Properties, [illegible] Yellowstone County, [illegible] supra, [illegible] Hempstead, 369 U.S. [illegible] (1962); [illegible] Line R. R. [illegible] of

Goldsboro, 232 U.S. 548, 558 (1913). Because the unsuitability provisions are an execise of police power, any taking which may result does not require compensation to the affected person.

In today's complex society the sovereign's police power can be exercised for a wide variety of purposes, including: the control of junk vehicles, State v. Bernhard, 568 P.2d supra; the destruction of dogs, Ruona v. City of Billings, 323 P.2d supra; zoning to restrict land use, Village of Euclid, Ohio v. Ambler Realty, 272 U.S. 365 (1926), mining, Goldblatt v. Hempstead, 369 U.S. supra, the operation of brickyards, Hadacheck v. Sebastian, 239 U.S. 394 (1915), oil exploration, Marblehead Land Co. v. City of Los Angeles, 47 F.2d supra; prohibiting the sale of alcoholic beverages, Everard's Breweries v. Day, 265 U.S. 545 (1924); railroad speed limits, Atlantic Coast Line R. R. Co. v. City of Goldsboro, 232 U.S. supra; restriction of historic building demolition or modification, Penn Central Transportation Co. v. City of New York, 438 U.S. 104 (1978); prohibition of commerce in eagle feathers, Andrus v. Allard, ____ U.S. ____, 100 S.Ct. 318 (1979); location and size of outdoor advertising signs, E. B. Elliott Advertising Co. v. Metropolitan Dade Co., 425 F.2d 1141 (5th Cir. 1970); wetland protection, Just v. Marinette Co., 201 N.W.2d 761 (Wisc. 1972); and the operation of surface coal mines, Maryland Coal and Realty Co. v. Bureau of Mines, 69 A.2d 471 (Md. 1949). Plainly the governmental action at issue, the potential preserva-

tion of the Tongue River valley hydrologic scheme and the preservation of unreclaimable lands, legitimately falls within the ambit of police power.

Not only are the lands unsuitability provisions within the proper exercise of police power, but even if an area is designated as unsuitable there is not even any taking. It is well settled that no taking occurs merely because a property owner is deprived of the most profitable use of his property. Penn Central Trans. Co. v. City of New York, 438 U.S. supra page 130 (the Supreme Court labeled an argument to the contrary as "untenable"). Andrus v. Allard, 100 S.Ct. supra at page 327. The Andrus v. Allard, 100 S.Ct. supra at page 327. The Andrus v. Allard case concerned the prohibition of commerce in eagle feathers, including those acquired prior to the enactment of the Eagle Protection Act. The defendant asserted that the Act resulted in an unconstitutional taking of his property without compensation. The Supreme Court ruled that there was no taking because there was no physical invasion or restraint upon the property and the only restriction was on but one means of disposition. The Court noted that the denial of one traditional property right did not always amount to a taking. Further, the Court found it "critical" to their conclusion that the appellees retained the rights to possess and transport their property. The unsuitability provisions similarly limit but one property right: the right to extract coal by surface mining

methods. The Plaintiffs may be restricted from making the most profitable use of their property only. They will continue to own, possess, and have physical control of their property and will continue to have the option of extracting the coal through underground mining methods.

Clearly the well settled principles of law repudiate any claim of an unconstitutional taking of private property. Surely such claims must be rejected and must not be given any consideration in resolving NPRC's petition.

It is also established that no individual has any right or entitlement to federal mineral resources and, hence, the decision by the federal government to refrain from leasing those resources does not constitute a "taking" of private property. No interveners have any property rights in unleased federal coal. In the case of Burglin v. Morton, 527 F.2d 486 (9th Cir. 1976), the plaintiff argued that a mineral lease application filed with the Department of the Interior gave rise to a constitutionally protected property interest in those minerals. This contention was rejected by the Ninth Circuit Court of Appeals which concluded that no property right arose by mere act of a lease application since the application did not generate any legal interest similar to a property right. In the immediate case, the interveners have an even more tenuous claim to the federal minerals since, unlike the unsuccessful plaintiff in the Burglin case, there are not even any lease application filed. Clearly, no intervener has any protectable property interests in the federal coal.

2. The legislative history of SMCRA demonstrates that no intervener has any "substantial legal and financial commitments" in the petition area.

Nearly all interveners contend that they have made "substantial legal and financial commitments" within the petition area and, pursuant to sec. 522(a)(6), and 81-4-228(5) MCA, are thereby exempted from the application of an unsuitability designation. The legislative history of SMCRA and the plain language of the regulations repudiates such contentions.

In drafting what ultimately became section 522 of SMCRA the House Interior Committee stated:

"The phrase 'substantial legal and financial commitments' in the [unsuitability] designation section and other provisions of the act is intended to apply to situations where, on the basis of a long term coal contract, investments have been made in power plants, railroads, coal handling and storage facilities, and other capital intensive activities. The committee does not intend that mere ownership or acquisition costs of the coal itself or the right to mine it should constitute 'substantial legal and financial commitments.'"

House Report [illegible], House Interior Committee, 95th Cong. [illegible] Sess., page 9[illegible].

The Committee's intention was effectuated in the regulations promulgated pursuant to SMCRA. Both the federal and state regulations define "substantial legal and financial commitments" to exclude the costs incurred in acquiring the coal or the right to mine it. 30 CFR [illegible] 26.4.1141(4) ARM.

No coal owner has invested in any capital-intensive activities prior to January 4, [illegible] as required by SMCRA and UMPA.

In fact, to date no coal owner has invested in the kind of capital-intensive activities which would create "substantial legal and financial commitments." Certainly then any claim of substantial commitments must be rejected and must not bar the application of an unsuitability designation to the petition area.

3. The OSM has the authority to designate federal lands within the petition area as unsuitable on the basis of NPRC's petition.

Several interveners contend that OSM lacks the authority to designate federal lands as unsuitable upon the basis of a citizen-initiated petition. These interveners argue that federal land can be designated unsuitable exclusively through the federal lands review mandated by sec. 522(b) of SMCRA. This argument wholly ignores the regulations which are now in effect and which control the resolution of NPRC's petition. As previously noted, these regulations are now immune from attack, particularly from attack in the present proceeding. The regulations explicitly provide for the designation of federal lands as unsuitable pursuant to a citizen-initiated petition. 30 CFR Subchapter F. Specifically, the regulations at 30 CFR sec. 760.3(b)(2) state that the regulations establish a process to designate federal lands as unsuitable via a citizen initiated petition. 30 CFR Part 769 establishes the particular procedure for a petition process for the designation of federal lands as unsuitable. OSM obviously has the authority to designate federal lands as unsuitable in accordance with the

regulations.

4. The lack of the data base and inventory specified by section 522(a)(1) of SMCRA does not bar action on NPRC's petition.

Section 522(a) of SMCRA, specifies that in order to assume primary regulatory authority, each state must establish a process which will enable objective decisions to be rendered on unsuitability petitions. This process requires the compilation of competent and scientifically sound data. Several interveners contend that no unsuitability petition may be processed and no area may be designated as a result of a citizen initiated petition until the data is compiled and the inventory completed.

The precise language of the statute is that in order to satisfy the requisites of section 522, the state must show that it has developed or is developing a process which will ultimately compile the data base. Section 522(a)(4). The statute requires only that the state demonstrate that it is developing the process, not that the process has already been developed.

Any concern with the authority of the state to accept and process unsuitability petitions prior to the compilation of the data base should have been raised when OSM was in the process of reviewing the Montana program. As previously noted, the Montana program was formally approved in April of 1980 and any objections to its approval had to be made within sixty days of the approval. No such objections were raised. The present proceeding is neither the time nor the place in which to raise the issue of the lack of the data base.

In any event, the statute clearly shows that the completion of the data base and inventory is not a prerequisite to the acceptance and processing of an unsuitability petition.

5. An area-wide unsuitability review is a proper means by which to review the unsuitability allegations made in the NPRC petition.

Various interveners have argued that a site-specific mine permit application review is a superior means of assessing the unsuitability issues raised in NPRC's petition. Should this argument prevail with OSM and DSL, then the unsuitability provisions of SMCRA and SUMRA are clearly superfluous and meaningless. Of course, neither Congress nor the Legislature intended to draft meaningless legislation.

The unsuitability process is a supplement to the mine permit review process. Congress obviously intended to protect large areas from surface mining if certain criteria are present. In fact Congress specifically stated that "the designation process is structured to be applied on an area basis, rather than a site by site determination." H. Rep. 95-218 supra, p.95. In this proceeding, NPRC has alleged the presence of those criteria. That some of the same criteria may also be reviewed in a permit review does not mean that criteria may not also be considered in an unsuitability petition review. The unsuitability provisions are an integral portion of the federal and state surface mine regulatory program. This integral aspect of the program should not be rendered meaningless.

6. OSM and DSL may properly consider the cumulative impact of surface mining within the petition area.

At the public hearing on NPRC's petition, comments were made to the effect that the cumulative impact of mining on the hydrology of the area is an improper ground upon which to base an unsuitability designation. These comments wholly overlook the plain language of SMCRA. Section 522(a)(3) provides that upon petition an area may be designated unsuitable for coal mining "operations if such operations" will, inter alia, "affect renewable resource lands in which such operations could result in a substantial loss or reduction of long range productivity of water supply or of food or fiber products, and such lands to include aquifers and aquifer recharge areas," (emphasis added). The simple language of the statute is directed to mining operations, the impact of more than one mine is obviously contemplated. Moreover, the simple language of SMCRA discloses that the impact of multiple mining operations on the hydrology is a valid basis for the designation of an area as unsuitable. This is specifically what NPRC is alleging: the impact from multiple surface mines within the petition area will cause a substantial loss or reduction of the long range productivity of the water supply. The intervenors' argument in this regard simply overlooks the plain language of the statute.

7. The petition area should be designated as unsuitable if reclamation is found to be either technologically or economically infeasible.

Section 522(a)(2) of SMCRA provides that an area must be designated as unsuitable for surface mining operations if the regulatory authority determines that reclamation pursuant to the Act is "not technologically and economically feasible." This language means that unless reclamation is both technologically and economically feasible, the area should be designated as unsuitable. In other words, if the regulatory authority determines that reclamation is either not technologically feasible or not economically feasible, then it must designate the area as unsuitable.

This construction of section 522 is in full accordance with the intent of the House Interior Committee as reflected in House Report 95-218, supra. At page 94 of House Report 95-218, the Committee states:

> "The committee wishes to emphasize that this section does not require the designation of areas as unsuitable for surface mining other than where it is demonstrated that reclamation of an area is not physically or economically feasible under the standards of the act." (emphasis added).

The express intent of the Congress and the language of the statute demonstrate that either technological or economical infeasibility of reclamation are valid and proper grounds upon which to designate an area as unsuitable.

8. The demand for coal from the petition area is a factor for consideration by OSM and DSL.

Section 522(d) specifies that prior to designating any lands as unsuitable for surface mining operations, a detailed statement on the potential coal resources of the area, the demand for those

coal resources, and the impact of an unsuitability designation on the environment, the economy, and the supply of coal, must be prepared. Obviously this detailed statement is intended to aid the decision maker in reaching the decision.

The unsuitability provisions require a mandatory unsuitability designation if the regulatory authority determines reclamation within the petition area is either technologically or economically infeasible. Section 522(a)(2). In addition, the regulatory authority has the descretion to classify an area as unsuitable if the authority determines, within a range of criteria, that coal mining should give way to competing uses of a higher benefit. H.Rep. 95-218, supra at p. 94. Plainly in resolving what constitutes the best land use of a particular area, the coal resources and the demand for that coal are important considerations. Congress demanded that such information be compiled so that the best land use could be rationally determined by the regulatory authority.

The regulations mandate that the regulatory authority must consider the demand for the coal. 30 CFR sec. 764.19 states:

> "In reaching its decision, the regulatory authority shall use---
> (3) The detailed statement prepared under Section 764.17(e);"

Section 764.17(e), in turn, requires the detailed statement on, among other things, the demand for the coal.

Without question, the regulatory authority must prepare a statement on the demand for the coal and utilize that statement

on finding an unsuitability [illegible]. The comments submitted at the public hearing that the demand for the coal was not a consideration for OSM and DSL ignores the applicable regulations and the intent of Congress.

CONCLUSION

For the foregoing reasons, it is apparent that there is no legal basis upon which to deny NPRC's request to designate the area as unsuitable. NPRC urges OSM and DSL to process, review, and resolve NPRC's unsuitability petition in full accordance with the applicable statutes and regulations.

Respectfully submitted this 30th day of October, 1981.

PATTEN & RENZ

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CERTIFICATE OF SERVICE

I, James A. Patten, hereby certify that I have caused true and correct copies of the foregoing PETITIONERS' MEMORANDUM OF LAW to be served via first class mail, postage prepaid upon the following:

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Date: 10-30-87

James A. Patten

STATEMENT OF [illegible] PRESENTED ON BEHALF OF THE NORTHERN PLAINS RESOURCE COUNCIL AT THE CONTEST HEARING ON THE TONGUE RIVER UNSUITABILITY PETITION, OCTOBER 21, 1981.

My name is [illegible] Boulding and I am an environmental consultant with training in geology, soils and water resources management. I am presenting my comments on behalf of the Northern Plains Resource Council. Although I currently reside in Bloomington, Indiana, I have been involved in evaluating policy and technical aspects of coal mine development in the Powder River Basin since 1973 when I participated in a number of the working groups of the Northern Great Plains Resource Program as a representative of the Environmental Defense Fund. In 1974 I was part of the TIE Environmental Impact Assessment Project's study team that critiqued the Department of Interior's 1974 Coal Leasing EIS, and in 1977 I visited several mines in Montana as a member of the Environmental Side of the National Coal Policy Project's Mining Task Force. I have served as a consultant to the National Academy of Science Committee on Soil as a Resource in Relation to Surface Mining for Coal and the Council of Energy Resource Tribe's study on the Control and Reclamation of Surface Mining on Indian Lands. I was a member of the Advisory Board for INFORM's study Reclaiming the West, and was a member of the Environmental Subcommittee of the NAS Committee on Surface Mining and Reclamation. In 1980 McGraw-Hill published a book I wrote titled Coal Mine Permitting: Meeting the Mandate of the Federal Surface Mine Law.

During the past year I have worked on the Office of Technology Assessment's Federal Coal Lease Study. Part of my responsibilities for that project were to evaluate the development and production potential of undeveloped federal coal leases and preference right lease applications in the Powder River Basin. The report I have written on this subject will be released by OTA within the next few weeks. I am also the author of the chapter on markets and projected demand for federal coal in the OTA report An Assessment of the Development Potential and Production Prospects of Federal Coal Leases. This report is also scheduled to be released within the next few weeks.

Key Issues Related to the Tongue River Unsuitability Petition

I would like to make five major points in relation to the petition and factors that OSM and DSL must consider in making a decision, and then focus my remaining time on economic and market factors that are significant in the petition area.

39 1. There is insufficient data covering too short a period of time in the Powder River Basin to make a determination whether it is technologically feasible to reclaim lands in the petition area.

39 The proper interpretation of this comment depends on the intended definitions of "reclamation" and of "success." It is agreed that reclamation success in a legal sense based upon the Montana act has not yet been accomplished or recognized in the Montana Powder River Basin. This is because no applications for bond release have been submitted for any existing mines in this area. Thus, the bond has not been released.

It should be recognized that the concept of what should be incorporated into reclamation plans has evolved and changed rather dramatically since the Montana act was passed in 1973. This evolution is the result of ongoing research and practical experience gained during and applied to reclamation at existing operations. Furthermore, the burden of proof for demonstrating the feasibility of reclamation (as it is defined in the Montana act), as part of the permit application process, has shifted to the coal companies (see 82-4-227 MCA). Consequently, the technological feasibility of reclamation in some subject areas will continue to increase, and in all subject areas it will be possible to more clearly demonstrate reclamation feasibility.

39 Expert opinions differ considerably as to whether current reclamation practices will ultimately succeed or fail to demonstrate technological feasibility. Consequently, in the absence of a concensus on the probability of success, the issue of technological feasibility should not be a major consideration in making a decision on this petition.

40 2. A very strong case can be made that it is not economically feasible to reclaim lands in the petition area under current market conditions and conditions that are likely to exist for at least the next ten to fifteen years. Designation of the petition area as unsuitable for mining is entirely justified on this basis.

41 3. The Petition Evaluation Document (PED) provides convincing evidence that the essential hydrologic functions of the Tongue River and related alluvial valley floors in the petition area will be impaired by mining (p. IV-10). Consequently granting of the petition can also be justified under Section 515(b)(10)(F) of SMCRA which requires preservation of the essential hydrologic functions of alluvial valley floors and 510(b)(5)(B) that prohibits material damage to the quantity and quality of water in surface or underground water systems that supply irrigated and naturally subirrigated alluvial valley floors.

42 4. There is ample evidence in the petition and the evaluation document in support of a discretionary unsuitability designation under Section 522(a)(3)(C) which allows designation where mining could result in a substantial loss or reduction of long-range productivity of water supply or of food or fiber products. The petition evaluation document did not analyze additional losses of productive land that would result from construction of the Tongue River Railroad, and when these losses are considered the case for an unsuitability designation on this basis [illegible] more compelling.

5. Designation of the petition area as unsuitable for mining would have no measurable adverse impact on the supply-demand situation for coal in the region during the next fifteen years, i.e. the possible cost of [illegible] million resulting from designation specified in the PED is the result of totally unrealistic [illegible] assumptions in the supply-demand analysis in the PED. Consequently [illegible] designation as unsuitable for mining [illegible] need to [illegible], the [illegible] that [illegible] will [illegible] in the United States.

40 See response to comment 5 of this letter and the "Economic Feasibility of Reclamation" section in chapter I.

41 The presence of alluvial valley floors was not [illegible] of the petition. Please see response 8, Hickcox letter.

42 Your comment is noted. The additional [illegible] to the railroad right-of-way would be approximately 1,800 acres ([illegible] communication, November 1981) for a line 89.2 miles in length and approximately 150 to 200 feet average width. The impacts of the rail line will be addressed in the ICC's environmental analysis expected to be complete by spring 1982. A decision on this petition would not necessarily affect the railroad because of the [illegible] resources in the region.

In summary, a decision to designate the whole petition [illegible] be [illegible] justified on at [illegible] grounds: 1) economic infeasibility of reclamation, 2) requirements for protection of alluvial valley floors, and 3) administrative discretion to protect the long-term productivity of water supply and food products.

Economic and Market Factors Affecting Mining in the Petition Area

In my more detailed comments on economic and market factors affecting coal mine development in the petition area I would also like to make five major points:

1. Even before the question of reclamation costs are considered, coal in the petition area is in a highly unfavorable competitive position with respect to coal from other areas of existing and proposed mine development in the Powder River Basin. These unfavorable factors include:

43 --Poor coal quality: available data indicates that heat content of the Knobloch seam in the petition area is generally lower than other areas of the Montana Powder River Basin, and high sodium content of the petition area coals create a strong market disadvantage due to fouling and reduced efficiency of boilers.

44 --The area is not as well served by existing transportation networks as other areas of existing and proposed mine development in the Powder River Basin. The need to construct the $150 million Tongue River railroad will create relatively higher transportation costs compared to other areas of the region.

45 --Other factors, such as overburden ratios and sulfur content are comparable to or slightly worse than other areas of the Montana Powder River Basin (and lower stripping ratios in the Wyoming Powder River Basin offset lower heat content), thus there are no especially favorable economic factors in the petition area to offset the disadvantages listed above.

46 2. While the coal supply/demand analysis in the PED shows quite clearly that coal from the petition area can be easily replaced by coal from other sources, unrealistic assumptions in the constrained leasing scenario give the false impression that some costs would be incurred by coal consumers if the petition were granted and the planned lease sales were not carried out as scheduled. The DOE

43 Please see chapter I.

44 Please see the "Economic Feasibility of Reclamation" section in chapter I.

45 Please see chapter I.

46 The analysis was conducted using the best information available at the time. Page III-15 of the draft document identified the $100 million impact of the designation as a worst-case alternative.

high production goals for 1995 used in the analysis are totally unrealistic. A more realistic projection for 1995 is 300 million tons which is 25 million tons lower than the production limit used in the constrained leasing scenario, and about 170 million tons less than estimates I have developed of potential production from the region without new leasing. If more realistic demand projections were used in the supply/demand analysis in the PED, there would be no difference in cost between the two scenarios rather than the $100 million shown in the PED. I will submit more detailed written comments that identify other problems with the coal supply/demand analysis in the PED.

3. The supply/demand situation in the Powder River Basin during the next fifteen years is such that it will be virtually impossible for coal from the petition area to compete with other areas of existing and proposed mine development in the region. Specifically:

47 --The DOE production goals upon which the proposed 1982 new production lease sale is justified are totally unrealistic. There is absolutely no need for any of the proposed new production tracts in the petition area to be leased to meet the likely high demand for coal from the Powder River Basin.

48 --Planned mine capacity in the Powder River Basin (excluding the Montco proposed mine) exceed the likely high level of 1990 demand for coal in the Powder River Basin (225 million tons) by 100 million tons. Planned 1990 capacity in the Wyoming Powder River Basin would meet the likely high level of demand even if Montana production [illegible]

49 [illegible]

50 [illegible]

47 See the response to comment 28 of this letter.

48 Your comment is noted.

49 Your comment is noted.

50 [illegible]

Leasing only the Wyoming new production tracts in 1982 would increase potential capacity to more than 200 million tons over likely high demand in 1995.

4. The specific supply/demand situation in the Montana Powder River Basin is such that increased demand during the next ten years will be easily met by existing and proposed mines outside the petition area. Specifically:

--The latest projections of the National Electric Reliability Council (July, 1981) indicate that Sebesta's 1980 projections for demand for Montana coal in 1990 should be reduced by ten million tons from 66 million tons to 56 million tons. Even this number is probably high.

51

--In order to justify construction of the Tongue River Railroad, the petition area would have to capture all of the incremental demand from 1980 to 1990 in Montana. This will be impossible due to adverse market factors mentioned above, and also because current contracted production for 1990 totals 46 million tons, only ten million tons less than likely demand.

52

--The only other possible source of new demand for Montana coal is export to Pacific Rim countries. It is highly unrealistic to expect Montana coal to capture any of this potential market.

53

51 Your comment is noted.

52 See chapter I and the response to comment 11 of this letter.

53 The transportation model considered export demands in accordance with the Department of Energy's 1995 demand scenario. Although the model does not allocate coal for export from the petition area, petition area coal may be substitued for those domestic coals that are exported and thus, not available to meet U.S. coal demand.

5. Even if all the market disadvantages of coal in the petition area were not as serious as my analysis indicates (i.e. Tongue River coal was fairly equally competitive with coal from other areas in the Powder River in terms of coal quality, overburden thickness, transportation costs/availability) it would be uncompetitive because reclamation costs will be higher. The petition area has poorer soils and more problem spoils than any other part of the Powder River Basin where existing and proposed mine developments are occurring. While it may be true that on a site specific basis, enough suitable soil material may exist to develop a reclamation plan in accordance with state-of-the-art reclamation practices, the cost will be considerably higher compared to mines outside the petition area because of increased complexity and materials handling to achieve soil reconstruction. Materials handling represents the single largest element of mining and reclamation costs, and increased materials handling will be necessary to accomodate the adverse soils and overburden conditions. Therefore, it is not economically feasible to reclaim soils in the petition area, even though it may be technologically feasible to apply (as yet unproven) state-of-the-art reclamation practices. I believe my earlier discussion justifies this statement without detailed site specific mine cost analysis (i.e. since it is not economically feasible to develop the area before consideration of reclamation costs, it is certainly not feasible to mine with the added reclamation costs).

54

54 Your comment is noted. For additional information, see the "Economic Feasibility of Reclamation" section in chapter I and the response to comment 56 of this letter.

In conclusion, I strongly urge OSM and DGL to deny [illegible] the entire petition area unsuitable for mining on the basis of economic infeasibility and the several other reasons mentioned at the beginning of my statement. I will be glad to answer any specific questions. Additional supporting data and arguments will be submitted in the form of written comments.

SUPPLEMTNAL MATERIAL TO RUSSELL BOULDING'S STATEMENT GIVEN AT THE OSM/DSL HEARING ON THE TONGUE RIVER UNSUITABILITY PETITION, ASHLAND, MONTANA, OCTOBER 21, 1981

This material provides more detailed analysis and back-up data for the points made in the Hearing statement. This material is divided into two major sections: 1) Technical analysis and 2) Market analysis.

TECHNICAL ANALYSIS

55 It is premature to base an unsuitability designation based on judgements concerning technological feasibility of reclamation. Reclamation experience in the Powder River Basin has covered too short a period of time to make any definitive conclusions concerning the long-term success of current state-of-the-art reclamation practices. The National Coal Policy Project (Murray, 1978), Wiener (1980) and the National Academy of Sciences Committee on Soil as a Resource in Relation to Surface Mining Coal (National Research Council, 1981) have all noted that although short term establishment of vegetation to standards has been demonstrated, in the Powder River Basin, [illegible] practices necessary to establish a stable, productive self-regenerating vegetative ecosystem remain experimental [illegible].

The critical [illegible] the [illegible] will be the ability of revegetated reclaimed lands to withstand extended periods of drought with the same resilience of vegetation on native soils. The Mining Task Force of the National Coal Policy Project has noted that the periodicity of drought cycles ranges from 15 to 20 years, and also that reclamation up to 1977 had experienced the benefit of [illegible] precipitation (Murray, 1978, [illegible] 263). [illegible] statement [illegible] Montana [illegible] occur [illegible] the last [illegible], it will [illegible] the [illegible] of vegetation [illegible]. At that time, [illegible] released.

56a The [illegible] will [illegible] construction [illegible] the [illegible] in Montana. The argument [illegible] in the next section on market analysis that it [illegible] to reclaim the lands in the petition area. [illegible] examine some of the [illegible] that [illegible] weight to this argument. [illegible], it [illegible] that the petition [illegible]. The [illegible] analyzed [illegible]

55 We would agree that the "jury is still out" regarding revegetative success on existing operations. However, research and monitoring efforts on present coal mine reclamation surfaces indicate that these efforts show promise, although not proof of reclamation success. The ability of vegetation reclaimed surfaces to resist drought conditions is a very important criterion and one which must be evaluated as part of the bond release process (see 82-4-233 (1)(b)).

For further discussion of the technological feasibility question, please see the response to comment 39 of this letter and response [illegible], Andrews letter.

56a The comment is treated in the following responses.

...widely divergent ... by those who support and th... who oppose the petition. For the purpose of the argument I make later concerning the economic infeasibility of reclamation, soils data are significant if they can shed light on the following question: Are there differences between soils in the petition area and soils in other areas of existing and proposed mine development in Montana that would cause significant differences in reclamation costs?

A general approach to this question can be... looking at the general reclamation potential ratings of soil associations in the Powder River Basin by Packer (1974). This is shown in the first column of Table 1. The petition area lies entirely within soil association 31, which Packer gives an overall reclamation potential rating of poor (see Plate 3, Packer, 1974). Table 1 also shows that the Colstrip area and the Sarpy Creek area (Absaloka Mine) are also located with soil association 31. The Decker area mines (Decker, Spring Creek, Pearl, CX Ranch) are located within soil association 117, which Packer rates as having an overall reclamation potential of fair in Plate 3, although the numerical rating of -3 is the same as for soil association 31. Proposed mines in the Youngs Creek and Tanner Creek areas of the Crow Reservation would affect soils that have significantly higher reclamation potential compared to other areas mentioned above. Soil association 25 has a numerical rating of +8, and is rated on Plate 3 as having good reclamation potential. This very generalized data indicates that the petition area is comparable to the Colstrip area, somewhat worse than the Decker area (poor vs. fair overall potential) and considerably worse than the Crow reservation proposed mine areas.

56b

This data is too generalized to draw very firm conclusions. It is pertinent to compare on a site-specific basis soils in the petition area that are proposed for mine development with soils in other areas of existing and proposed mine development. If there are significant differences in the quality and suitability of soils between proposed mines in the petition area and existing and proposed mines outside the petition area, then it is possible to say that relative reclamation costs will differ. Materials handling represents by far the largest component of reclamation costs, thus an area that has a higher percentage of poor or unsuitable soil materials than another area will have higher relative reclamation costs because more complex soil reconstruction plans will require greater materials handling. Persse, et al., (1977) found that materials handling amounted to 77-87 percent of reclamation costs at three sites in the Northern Plains. Wiener (1980) found a range of 73-97 percent for eleven mines in the west. With materials

56c

56b

Your analysis is noted; the comparative information is too general to provide a basis for a designation decision. Please see the "... Feasibility of Reclamation" section in chapter 1.

Your comments are noted. It does not follow "a priori" that, if there are significant differences in the percentage of poor or unsuitable soil (and overburden) materials, relative reclamation costs will be substantially different. This is because differences in soil quality would not "a priori" cause differences in the quantity of materials requiring special handling or in the complexity of soils reconstruction that would be necessary.

The most important criteria to apply in this regard would appear to be related to the following questions: (a) what is the quantity and location of suitable soil and overburden material at a particular site. (b) what will be required in the way of labor and equipment to retrieve and use it, and (c) is there enough suitable material to meet the surface reclamation requirements of the Montana act?

56c

A hypothetical example of this might be the following: Two sites are identified each with similar coal resources and overburden volumes. Let us assume that in the first case 50 percent of the overburden is suitable and in the second case only 25 percent is suitable. If we further assume that this suitable overburden is at the surface and that the average overburden depth is 100 feet, then, in the first case, 50 feet of suitable overburden are available and, in the second case, 25 feet are available. If we go on to assume that 10 feet of suitable material would be needed to satisfy surface reclamation needs than the amount of special handling of suitable materials would be the same in each case, i.e., the surface 10 feet of material. Thus the costs of materials handling would also be similar. In both cases, the rest of the overburden would be of no consequence to surface reclamation.

The kind of differences that could become important as far as reclamation costs are concerned would be where there were significant differences in the location of suitable materials of comparable volume or when the percentage of suitable material at any particular site became so low compared to another site that the volume of such material would be inadequate for burying undesirable materials.

Table 1. Soil Reconstruction Potential of the Petition Area and other Parts of the Montana Powder River Basin

Location	Soil[1] Assn.	Soil Reconstruction Potential[1] (%) Good	Fair	Poor	Soil Suitability for Plant Growth[2] (%) Good	Fair	Poor	Unsuitable	Heat Content BTU/lb.
Petition Area									8,[illegible]-9,[illegible]
Montco	31 (-3)								
Ashland (Coalwood)	31 (-3)	3	[illegible]	84	4	28	25	4[illegible]	
Cook Mountain	31 (-3)	n.d.	n.d.	73	n.d.	n.d.	18	41	8,[illegible]
Coal Creek	31 (-3)	n.d.	n.d.	94	n.d.	n.d.	32	4[illegible]	8,246
Ashland (Decker-Birney)	31 (-3)	4	11	85	1	14	17	68	8,354
Northwest Otter Creek	31 (-3)	0	7	93	3	17	[illegible]	4[illegible]	8,497
Southwest Otter Creek	31 (-3)	[illegible]	16	84	2	[illegible]	[illegible]	4[illegible]	8,194
Other Areas in Montana									
Colstrip (WECo)									[illegible]
Area A & B	31 (-3)	21	2	7[illegible]	19	[illegible]	[illegible]	[illegible]	8,9[illegible]
Area C	31 (-3)	29	3	67	3[illegible]	[illegible]	[illegible]	[illegible]	8,9[illegible]
Area D	31 (-3)	0	19	76	24	[illegible]	[illegible]	[illegible]	8,68[illegible]
			(5% too variable to rate)						
Big Sky	31 (-3)								8,[illegible]-8,[illegible]
Decker									
North	117 (-3)		9[illegible]	[illegible]	[illegible]	4[illegible]	[illegible]	4[illegible]	9,[illegible]8
West	117 (-3)								9,553
East	117 (-3)								[illegible],129-9,696
Spring Creek	117 (-3)								9,4[illegible]0[4]
Pearl	117 (-3)								8,[illegible][5]
CX Ranch (PKS & Consol)	117 (-3)								9,647[4]
Absaloka	31 (-3)								8,[illegible]-8,4[illegible]
Youngs Creek	25 (+8)								9,4[illegible][5]
Tanner Creek	25 (+8)								9,4[illegible][5]

Table 1. (con't.):

Footnotes:

[1]From Packer (1974).

[2]Data from Tract Profiles developed for the Powder River Basin Coal Leasing EIS (BLM 1981).

[3]Unless otherwise noted, data from Tract Profiles.

[4]See Table 2 for sources.

[5]Data from Wyoming Coal Planning Assistance Project (1979).

56c handling constituting such a large percentage of reclamation costs, it is clear that relatively small changes in materials handling can result in significant changes in reclamation costs.

It is fortunate that the Tract Profiles developed to supplement the Powder River Basin Coal Leasing EIS provide fairly detailed soils data that allows a relative comparison of the likely complexity of soil reconstruction plans between the petition area and other mine areas in Montana. These Tract Profiles include Tables that list all of the soils within the tract boundary, and ratings for each soil according to soil reconstruction potential and soil suitability for plant growth. Table 1 shows the relative percentages of different categories of soil suitability and reconstruction potential for the five proposed new production tracts in the petition area (data shown for Ashland-Coalwood is for the [illegible] Mountain and Coal Creek tracts combined, the individual tract data was not complete), and for Colstrip Areas A, B, C and D, and for Decker North outside the petition area.

56d An interesting result of this comparison is that although the Colstrip area and the petition area are located within the same soil association, soils in the Colstrip lease areas (which for all intents and purposes are the same as the currently operating mine) are significantly better in terms of soil reconstruction potential and suitability for plant growth. Soils with poor reconstruction potential in the petition area range from 7? to 94 percent of the tract areas, whereas the Colstrip lease tracts have 6? to 76 percent soils with poor reconstruction potential. The only petition area tract that might be considered comparable to Colstrip is Cook Mountain which falls within the Colstrip range of soils with poor soil reconstruction potential. However, the Colstrip tracts have significantly higher percentages of soils with good reconstruction potential compared to this tract (2? to ?2 percent on tracts A, B and C, compared to around ? percent for Cook Mountain). Differences between the petition area lease tracts and the Colstrip area are even more apparent when suitability for plant growth is compared. Soils in the petition area tracts that are unsuitable for plant growth range from 41 to 6? percent of the area, [illegible] of the Colstrip tracts. [illegible] area tracts that have good [illegible] to 4 percent of the [illegible] of the Colstrip tracts.

[illegible] areas of [illegible] within the [illegible],

56d Please see the response to comment [illegible] of this letter [illegible] response to comment 25 of the oral testimony (chapter [illegible]

56d

[illegible] worse from a reclamation standpoint. This difference is further accentuated by the fact that the coal in the petition area tracts is lower in heat content than in the Colstrip area. Thus, even if soils were not significantly different, reclamation costs per ton would be higher.

56e

There is less site-specific data to compare [illegible] in the petition area tracts with soils in areas of [illegible] development in other soil associations. It has already been noted that the Decker area (soil association 117) has been rated as having a better overall reclamation potential compared to the petition area (fair vs. poor). The Tract Profile Data for North Decker bear this out. Only 10 percent of the area in this tract is rated as having poor soil reconstruction potential (compared to 73 to 94 percent in the petition area tracts). Although the tract is similar to the petition area tracts in terms of soil unsuitability for plant growth (47 percent compared to a range of 41 to 68 percent), the Decker tract has a significantly higher percentage of soil with fair suitability (43 percent compared to 14 to 28 percent). Thus, overall the soils in the Decker tract pose fewer reclamation difficulties and hence are likely to have lower reclamation costs compared to the petition area tracts.

56f

Although no site-specific soils data is available for the Crow Reservation proposed mine area, the soil association there (25) has a significantly higher rating for reclamation potential by Packer than the other areas discussed previously, and I think it is reasonable to conclude for the purpose of this analysis that relative costs of materials handling for soil resonstruction would probably be lower in that area than any of the areas just discussed, and substantially lower than the petition area.

56g

One thing that should be noted before leaving the topic of soils is that comparisons of Packer's ratings for rehabilitation response units might result in different relationships than those noted here. The rehabilitation response unit concept involves factors of vegetation and precipitation as well as soils. While there is some merit in the conceptual approach, I have some problems with the way it is developed by Packer (for example the precipitation factor does not have any sensitivity to variations in seasonal distribution). This is not the place for a detailed critique of the rehabiliation response unit concept, but suffice it to say that for the purpose of the analysis here, the soils factor is the only one that is pertinent because it is most significant in relation to costs of reclamation. Native vegetation and precipitation may be significant factors

56e Please see the responses to comments 56b and 56c of this letter and the response to comment 25 of the oral testimony (chapter III).

56f Please see the response to comment 56b of this letter.

56g Your comment is noted.

56g in the ultimate success of reclamation, but are not amenable to analysis in terms of reclamation costs (as in precipitation) or significant (as in vegetation, since this represents a relatively small percentage of total reclamation costs).

57 Cumulative impact analysis is appropriate and necessary in order to make a decision on the petition. A number of industry spokesmen at the October 21 hearing in Ashland argued that it was inappropriate for OSM and DSL to conduct a cumulative impact analysis for the petition area. Their contention was that the concerns of the petitioners will be adequately taken care of by the mine permit review process and that mining should be prohibited only when cumulative impact analysis conducted as part of the permit review indicates that unacceptable environmental impacts will rosult. The central fallacy to this argument is that mine by mine permit review is inadequate because development in the petition area is an all-or-nothing proposition. Justification for construction of the Tongue River Railroad has been prediated on a minimum of 30 million tons production from the petition area in 1990 (Petition Exhibit 1, p. 6). In actuality, due to adverse market factors discussed herein later, production levels of 60 million tons/year or more would probably be necessary to compete with other coal from the Powder River Basin in terms of transportation costs. Thus a decision to allow one mine essentially implies a commitment to allow full-scale development of the petition area. In light of this it is entirely appropriate to consider cumulative impacts of full-scale development as a significant factor in making a decision on the petition.

58 Granting of the petition can be justified in part on the basis of requirements in SMCRA for protection of alluvial valley floors. Section 522 of SMCRA does not explicitly refer to impacts on alluvial valley floors as being a basis for making a designation of unsuitability for mining. But, for the reasons cited above, requirements in both Section 515(b)(10)(F) (preservation of the essential hydrologic functions of alluvial valley floors) and Section 510(b)(5)(B) (prohibiting material damage to the quantity and quality of water in surface or underground water systems that supply irrigated and naturally subirrigated alluvial valley floors) are pertinent to this petition. The Tongue River Railroad makes mine development in the petition area an all-or-nothing proposition. If cumulative impacts analysis indicates that either the performance standards of SMCRA will be violated, or conditions for permit approval will not be met, then Sections 515 and 510 of SMCRA should be considered as factors in making an unsuitability designation. The petition document on page IV-10 provides good evidence that the essential hydrologic functions of alluvial valley floors, and the quality of water in surface

57 DSL and OSM believe, as demonstrated by the hydrology analysis in chapter II, that consideration of the potential cumulative impacts of mining is appropriate in evaluating particular allegations in a unsuitability petition.

58 The issue of alluvial valley floors was not an allegation and therefore no response to this issue is necessary. Please see the response to comment 41 of this letter and response 8, Hickcox letter.

and underground water systems that supply irrigated and naturally subirrigated alluvial valley floors will be materially damaged by the extensive developments of the petition area necessary to justify construction of the Tongue River Railroad.

58

While the primary basis for making an unsuitability designation must be the criteria in Section 522 of SMCRA, evidence that the cumulative impacts of development in the petition area would violate Section 515 and be unacceptable according to criteria in Section 510 provides further justification for both a mandatory and a discretionary designation of the petition area as unsuitable for mining. It is pertinent for a mandatory designation because it is conceivable that the adverse effects of mining on water quality might be mitigatable from a technological standpoint through construction of a desalinization plant. The cost of such mitigating actions would exacerbate the economic infeasibility of reclamation. It is pertinent in relation to a discretionary designation because the projected degradation in water quality will reduce the long-term productivity of irrigated and subirrigated lands in the petition area, and also downstream from the petition area.

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MARKET AND ECONOMIC ANALYSIS

This section develops in more detail the argument that coal in the petition area is economically infeasible to reclaim due to unfavorable market and environmental characteristics of coal in the petition area compared to other areas of existing and proposed mine development in the Montana Powder River Basin.

Coal resources in the petition area are uncompetitive with other coal areas due to poor quality. Available data on heat content and ash chemistry indicates that coal resources in the petition area are significantly poorer in quality compared to other existing and proposed areas for mine development in the Montana Powder River Basin.

The Petition Evaluation Document (PED) provides rather limited data on coal quality, but it appears that typical heat content of coal from the Knobloch seam (other seams are of minor significance in terms of resources) ranges from 8,250 BTU/lb (Table III-4, PED) to perhaps 8,675 BTU/lb which is the median for the range of 12 samples shown in Table II-2 (This table should show averages as well as ranges since the median may not be the same as the average). Data from the BLM Tract Profiles (see Table 1) indicates that something around 8,300 BTU/lb would appear to be a likely "typical" heat content. Table 1 compares heat content data for existing and proposed mines in the Montana Powder River

59

Additional available data do not appear to support the conclusion that petition area coal is uncompetitive due to poor quality. This allegation may be true in specific areas, but there may also be good quality coal available on a site-specific basis. The Montco site and many of the available coal tract profile data substantiate this. See additional information in the "Economic Feasibility of Reclamation" section in chapter I, the responses to comments 11 and 40 of this letter, and parts of chapter III, oral testimony.

It is standard practice in Montana to submit sulfur data in this format. To convert to percent sulfur to pounds of sulfur per million Btu's, use the following formula:

$$\frac{\text{percent sulfur} \times 1\ \text{lb}}{\text{Btu/lb}} = \frac{\text{lbs of sulfur}}{1{,}000{,}000\ \text{Btu's}}$$

59

As an example, if the coal is 0.3 percent sulfur and 8,000 Btu's/lb, then:

$$\frac{0.003}{8{,}000} = \frac{X}{1{,}000{,}000}$$

So X = 0.37; that is, there would be 0.37 pounds of sulfur per million Btu's.

To supplement your table 2, Montco has 0.37 to 1.1 pounds of sulfur per million Btu's and the lease tracts you reference in your table 1 all have less than 0.37 pounds of sulfur per million Btu's.

Basin, and Table 2 provides a more detailed breakdown of coal quality data from existing mines in the region. It can be seen that coal from all existing and proposed mines except Absaloka have higher heat contents than coals in the petition area. Coal from Absaloka appears to be comparable with the petition area in terms of heat content.

In addition to lower heat content, the coal in the petition area has unfavorable ash chemistry compared to other areas in the Montana Powder River Basin. Exhibit 1 of the Petition Document (p. 7) indicates that the high sodium levels in the petition area coal reduces boiler efficiency. Robert Bohman of Kaneb Services in Gillette, Wyoming, indicates that the high alkali content of coal at the proposed Montco mine is essentially unburnable by today's standards (letter to Office of Technology Assessment, June 15, 1981).

59 There is also some evidence that coals in the petition area tend to have higher stripping ratios and overburden thicknesses than other areas of the region. For example the five proposed new federal production lease tracts in the petition area (Cook Mountain, Coal Creek, Ashland (Decker-Birney) Northwest Otter Creek and Southwest Otter Creek) have average overburden thicknesses of 150 feet and stripping ratios of up to 6:1 cu yd/ton of coal. (See respective Tract Profiles.) These are considerably higher than average overburden thicknesses and strip ratios shown in Table 2.

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Data given in the PED on sulfur content are not adequate to evaluate sulfur content in the petition area coals. Data should be converted to lb sulfur/million BTU to make data comparable (see Table 2). Data in the PED (Table III-2 and III-3) give some indication that sulfur content of the petition area coals is comparable to and in some cases possibly somewhat less than other areas of the Montana Powder River Basin. Since the 1979 New Souce Performance Standards (NSPS) for sulfur dioxide essentially eliminate the sulfur advantage of Powder River Coal in distant markets (see later discussion of the USGS/PED model assumptions) even if sulfur content is slightly lower in the petition area coals, this doesn't in any way offset the disadvantages of low heat content, high sodium and (possibly) high strip ratios and overburden thicknesses compared to other coal desposits in the region.

OSM/DSL Supply/Demand Analysis

60 Due to the interaction of a number of economic and technical factors, declaration of the entire petition area as unsuitable for mining will have no measurable impact on the supply and demand picture for coal from

60 The analysis identifies the $100 million cited on page III-15 of the draft document as the worst-case scenario. Furthermore, the transportation model is an estimate of the efficient allocation of coal between suppliers and demanders, and the petition area coal must be considered relative to all other available coals. Thus, the petition area coal is considered more competitive than Wyoming coal (even with the 1982 lease sale) under the current limited leasing scenario and within the limitations of the USGS economic model.

TABLE 2. GEOTECHNICAL DATA: MONTANA EXISTING MINES

MINE NAME	SEAM THICKNESS (ft.)	HEAT CONTENT (BTU)	SULFUR (lbs/10^6 BTU)	ASH (%)	OVERBURDEN (ft.)	STRIP RATIO
Colstrip	23(1) 27(2) 25(3) 24(4)	8750(1) 8800(2) 8700(3) 8750-9018(4)	0.91(1,2) 0.8(3) 1.01-1.11(4)	8.4(1,2) 8.9(3) 8.0-8.4(4)	90(30-160)[2] 75-100(3)	3.0(3)
Big Sky	26(1) 36(2) 35(3) 37(4)	8450(1,3) 8600-8750(2) 8360(4)	0.89(1) 0.86-0.91(2) 0.95(3) 1.2(4)	10.4(1,3) 8.4-8.5(2) 9.1(4)	50-90(2) 75(3)	2.0(3)
Spring Creek	50-80(1)	9400±(1)	0.53±(1)			
~~Decker East~~ East	52(1,2,3) 55(4)	9600(1,2) 9650(2) 9129-9696(4)	0.41(1,2) 0.42(3) 0.44-0.58(4)	3.7(1,2,3) 3.7-4.8(4)	70(0-150)[2] 98(3) 30-220 ~~60-70(1)[4]~~	1.8(3)
North West	38(4) 50(4)	9380-9738(4) 9553(4)	0.43-0.45(4) 0.35(4)	4.1-5.1(4) 3.7(4)	140(4)	
Absaloka	58(1,2,3)	8450(1,3) 8223-8573(3)	0.47(1) 0.61-1.86(2) 0.83(3)	10(1) 7.8-12.8(2) 11(3)	80(20-200)[2] 100(3)	2.2(3)
Divide	8(4)	10,150(4)	0.59(4)	5.7(4)	60(4)	

Data Sources
(1) ~~WESAP (1979)~~ Western Coal Planning Assistance Project (1979)
(2) EPA (1976)
(3) Kelly (1979)
(4) Oames & Moore (1980)

NOTE: Numbers in ( ) refer to data sources.

Source: Boulding (in press) Volume 2, Appendix 4.

the Powder River Basin during the next fifteen years. The OTA federal coal lease study that I mentioned in my hearing statement (An Assessment of the Development Potential and Production Prospects of Federal Coal Leases) has much data and analysis that is pertinent to the issue of supply and demand for coal from the petition area, but unfortunately it has not been officially released yet and I am not free to cite OTA's numbers on production potential from federal coal leases in the Powder River Basin and other specific conclusions in the report. The analysis here is based on data that has already been published and includes some elaboration to make it applicable to the petition area. I request that the OTA report mentioned above and my report Development and Production Potential of Undeveloped Federal Coal Leases and Preference Right Lease Applications in the Powder River Basin and Other Wyoming Coal Basins be incorporated into the hearing record (please contact Dr. Audrey Buyrn, Materials Program Manager, Office of Technology Assessment, Washington, D.C. 20510, 202/ 226-2210 concerning the availability of these reports).

The PED analysis concludes that there is a high degree of substitutability between coal from the petition area and other coals available from Montana and Wyoming and that relatively small changes in relative total delivered price of coal shipped to Midwestern markets can create large shifts in production to or from the petition area. The analysis also concludes that given the assumptions about coal price and quality of coal developed in the petition area, the national cost of meeting 1995 demand under a limited leasing scenario would increase by about $100 million (i.e., if the proposed 1982 federal coal lease sale, which includes five tracts in the petition area, does not take place). Thus the PED analysis gives the impression that designation of the petition area as unsuitable for mining under certain circumstances would have quantifiable economic costs.

A close look at the USGS/PED supply/demand analysis indicates that the $100 million cited in the PED represents a misleading quantification of costs associated with the decision to grant the petition. There are three main reasons for this: 1) Even if lease tracts in the petition area are eliminated due to an unsuitability designation, the planned leasing of Wyoming Powder River Basin Tracts in 1982 would add 60 million tons capacity to the Powder River Basin; 2) Due to inherent weaknesses in all coal supply/demand computer models, a relatively low degree of confidence should be placed in such a quantification; and 3) A number of the assumptions used in the USGS model create a bias in favor of Powder River coal and the model does not account for the adverse market factors discussed earlier that reduce the ability of coal from the petition tract to compete with coal from other parts of the Powder River Basin and other coal regions.

The U.S. Coal Transportation Model. There are two problems with coal supply/demand computer models that are of particular significance in relation to the PED analysis:

1. Coal models are least accurate at disaggregating coal supply functions to small geographic regions.

2. Models tend to seek optimal solutions to fuel procurement and the entire system tends to approach a general equilibrium solution. Rarely, if ever, are these conditions totally achieved in reality.

The reason coal models are least accurate at a specific geographic level is that small changes in assumptions may create large shifts in projected production between regions. This is due to the necessary simplifying of assumptions when developing coal supply functions. (Additional discussion of this problem can be found in ICF 1980 and Energy and Environmental Analysis, 1980.) At the aggregate level this isn't so much a problem because simplifying assumptions that may tend to distort results one way or another are more likely to cancel each other out. However, the modeling done for the PED is focused on differences in small geographic areas the point at which models are least accurate. This problem can be seen in Tables 3 and 4 where the USGS constrained scenario shows 48.7 million tons production from the Montana Powder River Basin in 1995, but shows only 4.0 million tons for the same year in the unconstrained scenario!

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61

Tables 3 and 4 show a number of difficulties in relating the USGS/PED model results to the real world. Table 3 shows only 3.6 million tons production from Subregion 2 (Sheridan, and Johnson Counties, Wyoming) whereas leased coal reserves in this area could support production levels in excess of 35 million tons (although there is considerable uncertainty as to whether this potential would be achieved by 1995). Subregion 3 is shown to produce 10.5 million tons, even though, as far as I am aware, there are no coal deposits in that area that are likely to be economically attractive to mine during the next 15 years. Subregion 5 shows 19.0 million tons of production which is far in excess of proposed mine development in that area. The strange reduction of production for Subregion 4 (Bighorn, Rosebud and Powder River Counties) from 48.7 million tons to 4.0 million tons has already been alluded to.

There appear to be some other discrepancies in the model results. The constrained scenario in the USGS/PED analysis was based on a low supply shortfall scenario developed by Jack Campbell. (Formerly with

61 Your comment is noted; an explanation is provided in Bernknopf, 1980, pp. 41-50.

Table 3. USGS/PED Constrained Scenario Compared to Other Estimates of Production Potential in the Powder River Basin Without New Coal Leasing.

State	USGS Model Subregion (Counties)	1995 Production Potential (no new leasing) mt			
		USGS[1]	Campbell[2]	BLM[3]	Boulding[4]
Wyoming	1. Campbell, Converse, Crook, Weston	169.7			
	2. Sheridan, Johnson, Niobrara, Fall River SD	3.6			
	3. Natrona, Albany, Platte, Goshen	10.5			
		183.8	251.0	338	331
Montana	4. Bighorn, Rosebud, Custer, Powder River	48.7			
	5. Musselshell, Stillwater, Yellowstone	19.0			
		67.7	94.3	82.5	138
	Total	251.5	325.3	420.5	469(530)[5]

Footnotes:

1/ Personal communication, Len Gordon, USGS, Washington DC, from printout for PED analysis.

2/ Production potential used for constrained scenario, PED analysis, from Appendix C, ICF (1981). The reason for the difference between these numbers and the USGS numbers shown in the first column is not clear.

3/ 1995 production potential, Table 2-2, Powder River Coal Draft EIS (1981).

4/ From Boulding (in press) modified to eliminate potential production from the petition area.

5/ Number in parentheses includes production potential if only the Wyoming new production tracts are leased in 1982.

Table 4. USGS/PED Unconstrained Scenario Compared with Other Estimates of Demand for Coal From the Powder River Basin in 1995.

State	USGS Supply Region[1]	USGS/PED[2]	DOE(1981)[3]	DOE(1980)[4]	ICF(1980)[5]	Most Likely Range[6]
Wyoming	1.	308.6				
	2.	3.6				
	3.	10.5				
		322.7	388.8			
Montana	4.	4.0				
	5.	19.0				
		23.0	385.0			
	Total	345.7	773.8	383.0	306	275-325

Footnotes:

1/ See Table 3 for list of counties covered in each region.

2/ Personal communication, Len Gordon, USGS Washington DC, from printout for PED analysis.

3/ DOE (1981) final high production goal for Powder River Basin. Note that the USGS/PED model run used the DOE high production goal for the whole US, but allocated only 345.7 of this goal to the Powder River Basin.

4/ Medium preliminary production goal (Doe, 1980).

5/ ICF mid-level demand (ICF, 1980).

6/ Based on review of available demand projections and anlysis of market factors and trends in the Powder River Basin.

the Council on Wage and Price Stability and now in the Department of the Interior) for an ICF study on potential impacts of overleasing and underleasing of federal coal (see Appendix C, ICF, 1981). These numbers represent Campbell's estimate of maximum potential production from the Powder River Basin with no new leasing of federal coal. However, Table 3 shows that the USGS/PED constrained production is 50 million tons less than the Campbell scenario. The reason for this discrepancy is not evident. Furthermore, Campbell's estimates of production potential without new leasing are quite low compared to more recent estimates. Table 3 shows that the Powder River Coal Leasing EIS identifies 420.5 million tons potential production in 1995 without new leasing, almost 100 million tons higher than Campbell's estimate. (It should be noted that the EIS estimate overstates potential production from preference right lease applications, but understates potential production from other sources). Estimates I have developed in relation to work I have done for OTA indicate as much as 470 million tons production potential in the Powder River Basin without new leasing.

An interesting result of the USGS/PED model results is that even though the unconstrained scenario represents a totally unrealistic demand for coal in 1995 (see later discussion for reasons), the amount of that allocated to the Powder River Basin by the model run was less than half the amount allocated by DOE in the final production goal - 345.7 million tons vs. 773.8 million tons (See Table 4). This indicates that the USGS/PED model probably used some more realistic assumptions than the DOE model run concerning the competitive position of the Powder River coal in relation to other regions. Even so, there are a number of assumptions that were used in the USGS/PED model run that tend to overstate demand for coal from the Powder River Basin, and the petition area in particular.

First, the model assumed full scrubbing of midwestern high sulfur coal, whereas the 1979 NSPS allow credit for sulfur reduction by cleaning. When this credit is considered, stack gas scrubbing requirements (in terms of percentage reduction) for midwestern coal are about the same as, or slightly lower than for western low sulfur coal (Boulding, in press). Furthermore, the USGS/PED model run assumed transportation costs for coal from the petition area would be the same as other parts of the Powder River Basin that are already served by rail lines. The need to construct the Tongue River Railroad will inevitably add to transportation costs from the petition area as compared to other parts of the Powder River Basin.

Supply/Demand Relationships in the Powder River Basin. The analysis in the previous section demonstrates that the results of a single computer model are not adequate for evaluating supply/demand aspects of the unsuitability petition. However, a broader analysis that evaluates projections by a number of different computer models plus comparisons with more "real world" data (production projections based on industry plans, utility needs, etc.) allows judgements to be made concerning the likely range of demand for coal from a region that can be viewed with a higher degree of confidence than can results of a single computer model. I have completed a systematic analysis of this sort for OTA's coal lease study for the period from 1980 to 1990. This section draws upon that work and extends the analysis to 1995.

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The results of my work indicate that the federal government and the coal industry are in for some real disappointments during the next fifteen years in the Powder River Basin. There is no question that there are going to be significant increases in coal production from this area, but air pollution standards, escalating transportation costs, and the fact that the energy industry consistently has underestimated the ability of the American people to reduce energy consumption in response to rising energy prices mean that the tremendous demand for Powder River coal that the coal industry is expecting is not going to materialize.

1990 Demand Projections. During the past year I have evaluated projections of demand for coal from the Powder River Basin from about twenty different sources, but I will examine just a few of the most significant ones here. Two sets of production projections are cited in the PED and the Petition itself: Sebesta (1980) and projections developed for the Northern Powder River Basin EIS (dated October, 1980, Exhibit 10, the Petition). The EIS projection identifies a potential production capacity in 1990 of 72.8 million tons from existing and expected mines and an additional 22 million tons from possible mines for a total of 94.2 million tons (The 73.5 million tons from other "mentioned" mines is too speculative to discuss here). Sebesta (1980) projected 66.4 million tons total demand from the Montana Powder River Basin. Note that this is slightly less than the 67.2 million tons projected for the whole state. If we assume that the petition area is designated unsuitable for mining, then the 9 million tons for the Montco Mine must be dropped giving potential capacity of 85.2 million tons, about 20 million tons more than Sebesta's projection. None of this capacity depends on new production leasing of federal coal, but then Colstrip production maintenance leases are necessary to achieve this capacity. Sebesta also doesn't include 24 million tons of potential production from Tanner Creek on the Crow Reservation which Shell

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62 Your comment is noted.

has an option to lease, provided markets can be found for the coal.

Sebesta's projections were based on the electric utility plans as of 1980, which projected an overall annual electric growth rate of 4.1% through 1990. The latest projections of the National Electric Reliability Council (NERC, 1981) have dropped this rate to 3.7% and have substantially reduced projected incremental utility demand for western coal (i.e. all production west of the Mississippi River) from 200 million tons to 146 million tons, a drop of over fifty million tons. I have analyzed the latest NERC regional projections in relation to Sebesta's projections (see Table 5) for the MARCA, MAIN and ECAR electric reliability councils and find that the revised projections require a drop of about 17 million tons demand compared to Sebesta's projections for shipments from the whole Powder River Basin to these regions. This translates into a total reduction for the Montana Powder River Basin of about 10 million tons in 1990. This reduction assumes proportional reduction from the Montana and Wyoming portion of the Powder River Basin for shipments to these regions and a similar reduction for Montana coal going to other reliability council regions than those in Table 5.

Thus, demand for coal from the Montana portion of the Powder River Basin is likely to be closer to 56 than 66 million tons in 1990. Since the Northern Powder River Basin EIS projections were made, Shell's proposed Youngs Creek mine probably merits being changed to the status of "expected" mine and missing from the list is the Greenleaf-Miller project (4 million tons/year), a noncompetitive lease Peabody Coal Company is getting in exchange for its Northern Cheyenne lease (BLM, 1981). If we add these to the EIS projections of existing and expected mine capacity (minus Monteco), we get a total potential capacity of 75.8 million tons - about 20 million tons more than the "likely" level of demand in 1990. In all likelihood, even 56 million tons is probably higher than actual demand will be for two reasons: 1) the latest NERC projection of 3.7% electrical growth rate is still higher than other recent projections for the same time period. The National Coal Association projects 3.5% in its most recent long-term forecast, and ICF projects 3.3%. There has been a consistent trend in recent years to decrease estimates of the electrical growth rate and NERC generally lags behind most other analysts. 2) The Wyoming portion of the Powder River Basin has potential capacity that far exceeds likely demand for coal from the whole region. Montana coal, although it has a slightly higher heat content overall, is more expensive to mine per BTU because of more favorable mining conditions (e.g., multiple seams; higher stripping ratios), and will experience stiff competition from Wyoming.

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Table 1. Incremental Demand for Montana Coal from the Powder River Basin 1979-1990 Based on Electric Utility Plans[1]

Reliability Council MARCA	Montana 1979	Montana 1990	Montana Increase	Wyoming 1979	Wyoming 1990	Wyoming Increase	Total 1979	Total 1990	1979-1990 Increase Sebesta	1979-1990 Increase NERC
MT	3.5	7.9[2]		--	--					
ND	--	3.9[2]		--	1.5					
SD	--	--		0.3	0.7					
NB	--	--		2.1	8.5					
MN	11.4	18.5		--	--					
IA	0.1	0.2		5.3	9.3					
	15.0	22.6	+7.6	7.7	20.0	+12.3	22.7	42.6	+19.9	+21.6
MAIN										
WI	2.7	4.3[3]		2.0	8.7					
IL	4.1	7.1[3]		5.1	2.7					
MO	--	--		0.9	5.1					
	6.8	11.4	+4.6	8.0	16.5	+ 8.5	14.8	27.9	+13.1	+ 1.1
ECAR										
IN	0.8	1.1		--	4.2					
MI	3.7	7.3		--	--					
OH	--	1.2[4]		3.6	3.9					
	4.5	9.6	+5.1	3.6	8.1	+ 4.5	8.1	17.7	+ 9.6	+ 3.2[5]
Total	26.3	43.6	+17.3	19.3	44.6	+25.3		88.2	+42.6	+25.9

Footnotes.

[1]All data from Sebesta (1980) except last column which is from National Electric Reliability Council (1981).
[2]Includes NSP unsited plant.
[3]Includes unsited ConEd plant.
[4]Includes plant sited in New York State
[5]NERC does not show western coal in ECAR. Incremental demand of 3.2 million tons estimated by taking same percentage of 1979 western coal use in ECAR from DOE (1979)-- 8% - of NERC projected demand for all western coal.

The tremendous potential excess capacity over likely demand in the region in 1990 is seen when the projection of the Powder River Basin Coal Leasing EIS (BLM 1981) for production from existing and proposed mine development in 1990 is compared with the likely range of demand, based on realistic assessment of various demand projections. The EIS estimates a production level (which should more accurately be called a potential capacity estimate) of 323.3 million tons in 1990. I have not included the 45.6 million tons capacity included in the EIS for preference right lease applications, because my detailed analysis of PRLAs in the Powder River Basin for OTA has shown that there is not likely to be any additional production capacity in the Powder River Basin from PRLAs in 1990. Moreover, it is highly uncertain whether there will even be any PRLA production after 1990. I can't cite specific numbers, but I will say that OTA's analysis indicates that BLM's 1990 figure (minus PRLAs) is conservative.

How does this compare with the likely range of demand for 1990? A likely range of demand can be obtained by looking at a number of different projections, and where they differ, looking for differences in assumptions and other possible reasons for the difference. This requires the expertise of individuals knowledgeable about the various factors affecting markets for coal. OTA brought together such a group to evaluate undeveloped leases in the Powder River Basin and southern Wyoming in October, 1980. This Task Force, which included individuals from government, the coal industry and citizens groups in the region evaluated undeveloped federal coal leases in the Powder River Basin, and as part of that analysis developed projections of likely ranges of demand for the Powder River Basin in 1990.

The Sobesta projections that were discussed earlier were developed specifically for this OTA Task Force meeting. The Task Force, upon review of those projections, concluded that this projection of 212 million tons for the Montana and Wyoming portions of the Powder River Basin was a likely upper limit for demand in 1990 and that actual demand probably lies somewhere between 190 and 212 million tons. This is somewhat more conservative than the ICF mid-level projection of 226 million tons (ICF 1980). The DOE preliminary production goals of 275 million tons (DOE 1980) and the final goal of 295 million tons (DOE 1981) have very little relationship to the market place and are far beyond the likely high range of demand. I don't have time to go into a detailed critique of the DOE production goals, but refer you to the OTA study which does offer a reasonably detailed analysis of deficiencies in the DOE projections as well as a more detailed analysis of a number of other projections for the Powder River Basin.

If we take ICF's 226 million tons as a generous estimate of the likely high level of demand (keeping in mind that the Wyoming Task Force considered Sebesta's somewhat lower projections to be high, and that my recent update of his numbers substantiate this), then existing and planned mines will have about 100 million tons of excess capacity if current industry plans are realized. Planned mine capacity in Wyoming alone is 245 million tons, so demand from the region could be met by production from Wyoming with capacity to spare even if Montana doesn't produce a ton more than it did in 1980. Overall, Wyoming has a competitive edge over Montana in virtually all potential markets in the country, except possibly the very upper Midwest and the Pacific Northwest. Thus even the existing and proposed mines in Montana outside of the petition area will be hard pressed to compete with Wyoming coal.

Justification for the Tongue River Railroad is based on assumed production of 25 to 30 million tons from the petition area in 1990. Contracted production from the Montana Powder River Basin totals 46 million tons. Since the modified Sebesta projections show a 1990 demand of 56 million tons, this leaves, at best, 10 million tons of demand available for new mine development in 1990. Other existing and proposed mines in the Montana Powder River Basin will be competing heavily for that 10 million tons of incremental demand, and considering the distinct market disadvantages of coal in the petition area, it is hard to imagine how coal from the petition area will capture any part of that demand.

The only other possible source of demand for coal from the Powder River Basin that has not been considered is the preceding analysis (which takes into account likely demand for synfuels) is export to Pacific Rim countries. This is not factored in because it is unrealistic to expect the Powder River Basin to obtain a share of west coast export demand during the next ten to fifteen years. This view is shared by G.B. McMeans of Kaiser Engineers who has stated "we are not optimistic about the export potential of Powder River Basin subbituminous coals" (McMeans, 1981).

Western coal throughout the U.S faces strong competition in obtaining Asian markets. The National Caol Association estimates that countries in the Far East will import from 153 to 180 million tons in 1990 (NCA, 1981). NCA's estimated range of coal exports for the countries that compete with the U.S. for Asian markets (Australia, Canada, China, the Soviet Union and South Africa) in 1990 is 195 to 240 million tons. This is well above the range of import demand for the Far East (although

all export from these countries is unlikely to go to this area). Western coal may obtain some of this market -- ICF (1980) and the DOE Interagency Coal Export Task Force (DOE, 1981) estimate upper limits of west coast exports in 1990 of 14 to 15 million tons respectively.

Thus the petition area would have to capture all incremental demand for coal from the Montana Powder River Basin and all of the 1990 west coast export (under high demand conditions) to produce 25 million tons capacity, which would scarcely justify construction of the Tongue River Railroad. However, as already discussed, the petition area can't compete with the other areas of Montana for incremental domestic demand, and Powder River coal in general is at a strong disadvantage with respect to Colorado and Utah for capturing export demand because of low heat content, high moisture content and long transportation distances. Furthermore, there is considerable uncertainty as to whether 15 million tons of port capacity will be in place on the west coast by 1990. The coal industry has given a higher priority to efforts to improve port facilities on the East and Gulf coasts than on the West coast.

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1990 Demand Projections. Table 3 shows that estimates of potential production from the Powder River Basin in 1995 range from 325 to 470 million tons without new leasing and without production from the petition area. Table 4 compares the USGS/PED model results with various other model projections. The DOE final production goals are grounded on false assumptions and are insupportable. Among other things the DOE goals assume that a synfuel production goal of 1 million barrels of oil/day equivalent is achieved in 1990, which is an order of magnitude higher than even industry estimates. DOE also assumes complete replacement of natural gas in utility and industrial boilers in accordance with the now repealed Section 301(a) of the Powerplant and Industrial Fuel Use Act. The problems with the DOE preliminary production goal of 383 million tons have been thoroughly analyzed by ICF (1980), and the ICF projection of 306 million tons is the result of correcting a number of deficiencies in the DOE model, both in terms of the structure of the model and input assumptions. For example, the DOE preliminary goal was based on an assumed [illegible] in transportation costs from 1978-1985 of 17%, whereas ICF found that between 1978 and 1980 alone real increases (i.e. adjusted to account for inflation) were 10.5%, almost as much as DOE's projected increase over the seven-year period.

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63 Your comment is noted.

I have identified 275 to 325 million tons as a "likely" range of demand for Powder River Basin coal in 1995. I consider this to be a generous estimate of likely range, and if trends in electrical growth of the past few years continue, which some analysts expect (see for example the report of the Solor Energy Institute, 1981), then actual demand could well fall considerably below 275 million tons. If we compare this "likely" range to potential capacity in 1995 shown in Table 3, it is apparent that the higher projection of demand (325 million tons) is at a low end of the range of potential production without new leasing. If the new production federal lease tracts of the petition area are eliminated, but the Wyoming new production lease tracts are leased in 1982, potential capacity exceeds likely high 1995 demand by about 200 million tons. Clearly designation of the petition area as unsuitable for mining would have no impact at all on the supply/demand situation in the Powder River Basin in 1995 and demand could probably be met with no new leasing through the year 2000. Resumed federal coal leasing for new production might be justified in 1990 to meet potential post-2000 demand.

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Market and Environmental Factors Mean that Reclamation in the Petition Area is Economically Infeasible. The previous discussion has shown that for purely market reasons coal in the petition area is non-competitive, or at best marginally competitive with coal from other areas of existing and proposed mine development in the Montana Powder River Basin. The final blow to any marginally competitive position that coal in the petition area may have comes when reclamation costs are considered. The earlier technical analysis has provided good evidence that soils in areas of proposed mine development in the petition area are of significantly poorer quality when compared to other areas of the region, which will increase the complexity of soil reconstruction plans resulting in higher reclamation costs. These costs will be further increased on a per ton coal basis because the petition area has significantly lower heat contents as a whole compared to other areas of existing and proposed mine development. I think this data supports the conclusion that it is not economically feasible to reclaim soils in the petition area, even though it may be technologically feasible to apply (as yet unproven) state-of-the-art reclamation practices. Detailed site-specific mine cost analysis is not necessary to further substantiate this conclusion. Since it does not appear economically feasible to develop the area before consideration of reclamation costs, it is certainly not feasible to mine with the relatively higher added reclamation costs.

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64 Your comment is noted.

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COMMENTS ON TONGUE RIVER UNSUITABILITY PETITION
Richard Opper, OPCO Consulting Services
10/30/81

I am submitting the following written testimony in addition to the verbal testimony I presented at the Petition Hearings in Ashland, Montana, on October 22, 1981.

65 SHALLOW SOILS: The fact that 59% of the soils overlying coal reserves in the petition area are 18 inches deep or less, and that 23% of those soils are only 6 inches deep or less is an obstacle to reclamation. The high percentage of shallow soils necessitates the use of suitable spoil material along with or in place of topsoil. Selective placement of spoils increases production costs of Tongue River coal which was shown by Dr. Russell Boulding in the petition hearings to be already non-competitive in a soft coal market. As a very minimum restriction, selective spoil placement requirements prohibit the use of dragline operations, and only truck and shovel operations should be considered.

SMECTITE IN SOILS:

1. Saturation percentage is an inaccurate and subjective test.

2. As a result of a misinterpretation of Dr. Dollhopf by OSM and DSL saturation percentage was used incorrectly, and

3. Cation Exchange Capacity (CEC) should have been used instead of saturation percentage to seven for smectite in soils.

66a Saturation percentage of soils and overburden is dependent upon several factors, including soil or overburden texture, clay type, and type of exchangeable cation. Saturation percentage is determined by estimating how much water by weight is required to saturate the pore spaces in a known weight of soil. The saturation point, which theoretically increases with increasing clay, increasing percentage of smectite within the clay fraction, and increasing exchangeable sodium as measured by SAR, is not determined by analytical testing, but rither estimated by laboratory technicians. Results of the test can vary considerably depending upon the technician in charge. An example of the subjectivity of this test is derived from the Montco permit application soils data. Sample #10301, 34-48 inches, was categorized as having a saturation percentage of 62.4, yet clay comprised only 5% of the sample, and the sample SAR was a low 3.41. Yet sample #11320, 66-78 inches in depth had a lower saturation percentage of 54.2 even though the sample had 52% clay and its SAR was 36.2. Organic matter, another factor affecting

65 Please see the response to comment 56 of this letter, the response to comment 19 in chapter III, and revisions in chapter II.

66a We would certainly agree that determining saturation percentage involves some subjectivity and judgment on the part of laboratory technicians. Inasmuch as the same methodology and subjectivity are utilized in the initial steps of the procedure for determining SAR's and EC's, the criticism of the saturation percentage must extend to SAR's and EC's. If the validity of saturation percentage measurements is questioned because of the subjectivity in determining them, then the validity of SAR and EC data must be questioned for the same reasons. However, the latter data are the basis of the unsuitability petition.

We will certainly acknowledge that there are probably errors in some of the data regarding saturation percentages, one of which you pointed out. However, one error does not prove that most or all of the data are useless.

saturation percentage, was virtually the same for both samples. The Hagen example is admittedly somewhat extreme, however, it does illustrate the unreliability of saturation percentage test results.

66b The document states on page IV-31 that "Dollhopf and others (1981) have recommended that when sodic materials exhibit saturation percentages that exceed 90 percent, such material should be excluded from use as root zone media because of the increased potential for deterioration of soil physical properties and upward salt migration". The spoil material used in Dollhopf's study exhibited saturation percentage of 75+15. Although it is appropriate to exclude materials having saturation percentages of 90 or greater, it cannot be concluded that materials having saturation percentages less than 90 are suitable. Dr. Murray Klages, a co-author of the same paper, has informed me in personal communication that a more accurate interpretation of Dr. Dollhopf's statement would be that materials having saturation percentages less than 75+15 or 60% are probably suitable for use as root zone media (barring excess salinity or toxic materials). Thus, a saturation percentage of 90 or greater is an acceptable maximum level, but 60% should have been used as the minimum value to screen for potentially unsuitable materials.

66c Cation exchange capacity (CEC) bears a direct relationship to clay mineral composition. Baver, et al. (1972) states that the CEC of kaolinite clays is 3 to 15 milliequivalents per 100 gms of clay (meq/100g), illites have a CEC of 10 to 40 meq/100g and smectites 80 to 150 meq/100g. Klages and Hopper (1980) found tha 88% of the variation in CEC values in clay samples from overburden in Bighorn County, Montana and Sheridan County, Wyoming could be explained by the clay mineralogy of the samples. Soils data from the Montco mine permit application contained over 140 CEC determinations. These values should have been used to screen for smectite in response to our allegations in the Lands Unsuitability Petition. The CEC values in the Montco data represented total soil CEC. The values can be divided by the percent of clay to determine the CEC of the clay within the samples. Nelson and Nettleton (1981), in a paper accepted for publication, determined that smectite and illite are present in approximately equal amounts if the clay CEC of a sample is 55 to 70 meq/100g. The clay CEC of the Montco soils average 56 meq/100g, so we feel that our allegation that Montco soils "contain appreciable amounts of smectite clays" is a valid one. A few Montco soils contained sufficient amounts of organic matter to have resulted in a slight overestimation of clay CEC values. It can be concluded from the data, however, that the clay fraction of the Montco soils are comprised of 40 to 50% smectite, certainly enough to merit placing considerable concern on the high levels of exchangeable sodium seen in locations in the Montco permit area.

66b The indicated statement in the [illegible] document is based on a recommendation on page 7 of Dollhopf's report. We used what the report recommended, and our representation of it in the document is accurate (Doug Dollhopf, oral communication, November 18, 1981).

It appears that there may be some confusion in this comment between what was said in the body of Dollhopf's report and what one of the recommendations was. The number 75 (± 15) refers to the average saturation percentage (± one standard deviation) of the spoil material Dollhopf studied at West Decker. The 90 percent figure is the threshold level recommended for sodic materials based on the professional judgment of the author.

66c Comments regarding the use of cation exchange capacity (CEC) in clay mineralogical determinations are acknowledged. Your calculations of the average clay CEC's for the Montco soils data are appreciated. However, it should be pointed out that CEC was not determined for all or even most of the Montco soil samples. Thus, the average clay CEC listed in your comment is not an average of the Montco soils but only an average of those samples analyzed for CEC. It was evident upon examination of the data that Montco's analysis of CEC was almost totally confined to those samples exhibiting SAR's greater than 10. We conclude that your calculations and documentation in the literature indicate that the soil samples analyzed "contain appreciable quantities of smectite clays." The presence of appreciable smectite does not, by itself, constitute a reclamation problem. The simultaneous presence of significant quanties of sodium and/or high total clay contents is also necessary. Thus the pertinent question is this: Would incorporation of CEC into the overall Montco soils evaluation change the basic conclusion on page IV-24 of the draft document?

To answer this question, all of the Montco soils data including CEC's were reviewed and volumes of suitable soil calculated on the Montco soils survey area. (Soils in the Tongue River floodplain were excluded from the calculations, since very little disturbance is being proposed by Montco at this time in this area.) The result was that, in all cases, data on clay CEC were not pivotal factors, over and above the limitations imposed by SAR, EC, and clay content, in precluding materials from the category of potentially suitable surface soil. In addition, DSL/OSM's new volume calculations indicate that the average depth of surface soil suitable for reclamation on the Montco soil survey area is unchanged from the value (17 inches) indicated on page IV-24 of the draft document.

67a SOIL AND OVERBURDEN SUITABILITY: The document did not state what were the maximum acceptable values for EC and SAR used in the study for determining soil and overburden suitability. Due to the appreciable amounts of smectite in the local soils, the maximum allowable SAR should be 15 or less. I refer to my masters thesis (Opper, 1980) to support this allegation.

67b In my research, five overburden samples were used for one test. Samples were relatively light textured; two were sandy loams, two were loams, and one was a silt loam. Two samples had clay fractions composed of 75-100% smectite. When the SAR of the samples was increased (by leaching with salt solutions) from 0 to 5, hydraulic conductivity of all samples was reduced by an average of over 80%. At SAR 10, hydraulic conductivity was less that 5% of what it had been at SAR 0. Hydraulic conductivity approached 0 for all samples at SAR 15.

67c Concerning soil suitability, I request that in preparing the final recommendations, OSM and DSL consider the findings of the BLM in their tract profiles for Ashland (Coalwood), Northwest Otter Creek and Southwest Otter Creek. These three tracts, all of which were located in the petition area, had soils which were rated between 43 to 46% unsuitable for plant growth. Also, between 84 to 93% of the soils within these tracts had poor reconstruction potential ratings.

68a SODIUM MIGRATION: Half of the overburden sampled by OSM and DSL in the petition area was saline and/or sodic with high exchangeable sodium the larger of the two problems. Overburden textures in the petition area were generally heavier than those used in the West Decker Study (Dollhopf, 1980). A large potential for sodium migration exists throughout the petition area should mining be permitted. This necessitates increased burial depths of sodic materials to mitigate the potential sodicity [illegible] topsoils.

68b Dr. [illegible] 1980 [illegible] that there is more [illegible] reclamation [illegible] biological productivity. Meaningful [illegible] must address long-term groundwater quality and [illegible] lands are suitability as well. Aquifers which form at the [illegible] of the mine pit must be buffered from excessively saline materials, and spoils with high levels of [illegible] sodium which would eventually render the aquifer [illegible].

In summary, [illegible] require the extension use of selective [illegible] the petition area. [illegible]

69

1. A [illegible] surface [illegible] and high [illegible] abundant [illegible]

67a The second paragraph on page IV-24 of the draft document lists the sources of the criteria used for determining soil and overburden suitability. In general, the maximum accepted values for suitable overburden relative to SAR, EC, and clay content were 12 and 6 mmhos/cm, and 40 percent, respectively.

67b Your comments are noted.

67c Please see the response to comment 25 of the oral testimony, presented in chapter III.

68a If half of the overburden sampled by DSL and OSM is saline and/or sodic, then it follows that the other half is nonsaline and nonsodic. The most meaningful comparison to make between petition area overburden and that of studies by Dollhopf and others (1980) at the West Decker mine would be to select the overburden identified as suitable in the petition area and make the comparison on that basis.

Please see the response to comment 27 of the oral testimony for additional information.

68b Please see responses to comment [illegible] of the oral testimony and comment 4 of this letter.

69 Please see responses to your earlier comments.

69 2. A potential for sodium migration arising from sodic spoil material heavier in texture than the spoils used in Dollhopf's West Decker Study (1980).

3. A need, overlooked in the document, to buffer the aquifer with suitable spoil material.

70 It is impossible to determine if the document's assertion that an average of 20 to 50 feet of suitable and accessible overburden and interburden would be available in the Montco proposed mine area because the document failed to define "suitable" in terms of electrical conductivity and SAR.

71 Wiener (1980) found that materials handling constituted 73 to 97% of total reclamation costs for 11 western coal mines. Selective placement will obviously increase reclamation costs considerably. Selective placement of substantial volumes of spoil materials in the petition area would be necessary. Appropriate (though yet unproven) reclamation practices for the many problems that are manifested there will not be economically feasible in a soft coal market.

70 Please see the response to comment 67a of this letter.

71 Please see the response to comment 56 of this letter.

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STATEMENT ON PRINCIPAL SOIL LIMITATIONS:
SALINITY - SODICITY - BORON

Re: Petition Area NPPC

Report to: Miss Margaret MacDonald,
Northern Plains Resource Council
419 Stapleton Bldg.
Billings, MT 59101

October 23, 1981

By

Fred M. Sandoval, Consultant
Certified Soil Scientist-Soil Specialist
4685 Clearview Rd, Belgrade, MT 59714
Ph (406) 586-5273

[illegible]

INTR[illegible]

I have fur[illegible] reviewed [illegible] documentation of lands within the NPRC Petition [illegible] the following comments prepared according to instru[illegible] consultant time constraints contained in M. MacDonald's letter [illegible] 1, 1981. The instructions were that a statement [illegible] the principal soil limitations that will involve [illegible] practices to achieve reclamation should lands within the Petition area be strip mined. The principal limitat[illegible] excess salinity, high sodicity, and possible [illegible].

A [illegible] salinity [illegible] occur on [illegible] published literature [illegible].[1]

P[illegible]

[illegible] - that the laboratory [illegible] the sampling were representative.

[illegible]

72 The laboratory [illegible] from the various soil-overburden [illegible], show that whil[illegible] materials to meet [illegible] mining, the quality [illegible] salinity and [illegible].

[illegible]

72 Your comments are acknowledged.

The EMRIA Report #1, 1975, Plates 25 and 26, describing the Otter Creek Study Site, show frequent high salinity and sodicity in soil materials as interpreted by electrical conductivity and sodium adsorption ratio, and the deep geology drill core data show relatively impermeable materials characterizing the overburden. The extremely slow hydraulic conductivity was probably due to high sodicity coupled with high clay content.

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Other data from samplings at the Montco, Otter Creek East, and at other sites also show that high sodicity should be expected to occur at a level of frequency to bear close scrutiny.

Boron:

Boron is essential for plant growth but at concentrations not greatly in excess of that needed, is toxic for many plants. If a standard USDA laboratory procedure (2,4,6) for boron analysis was used in the Petition area sampling, my interpretations should be correct. The laboratory procedure employed will influence the determinations. Because research (2) has shown that plants respond only to boron in solution and are not directly influenced by adsorbed boron, the preferred method is to analyze the saturation extract and convert the values to soluble in soil basis. Boron toxicity threshold tolerance levels have been suggested by research at the US Salinity Laboratory (6,7) and elsewhere (3). Concentrations less than 0.7 parts per million are considered probably safe; 0.7 to 1.5 ppm are probably harmful to sensitive plants and marginal to semi-tolerant; and concentrations above 1.5 ppm may be unsafe except to

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Montco soils data were reevaluated to determine whether the reported water-extractable boron concentrations would change the Montco soils survey area suitability evaluation already conducted and discussed on page IV-24 of the draft document and further evaluated in the response to comment 66c of this letter. Of those samples which were originally determined to represent suitable material (as discussed in the draft document) based on SAR, EC, clay content and saturation percentage, eleven samples exhibited boron concentrations greater than 1.0 ppm (using a 1:2 soil:water extract ratio method). The highest of these was 3.0 ppm. Since, in reclamation, we are dealing with a very significant number of species that you have indicated are tolerant or very tolerant to boron (i.e., wheatgrasses and perhaps alfalfa in a few areas) and because of the very small fraction of samples (representing otherwise suitable material) having boron contents greater than 1.0 ppm, the result of our original determination, as indicated in the draft document, of volumes of suitable soils on the Montco soil survey area is unaffected. An additional point is that although in the Montco soils data there were soil samples whose concentrations of boron were much higher than 3.0 ppm--as high as 15.0 ppm--all of these samples also had high EC's and/or high SAR's which rendered them unsuitable in the original evaluation discussed in the evaluation document.

Both Wyoming (Dennis Fransuay, Wyoming Department of Environmental Quality, oral communication, November 16, 1981) and Montana (Department of State Lands, 1977) have guidelines for soil and overburden suitability with respect to boron. These are 5.0 and 8.0 ppm respectively, both of which are well above the values indicated above in the Montco soils evaluation.

The data on the Montco project area overburden were also reevaluated to determine whether boron concentrations would significantly affect the suitability evaluation discussed in the draft document. It was found that the average concentrations (by drill hole) of water-extractable boron in material originally determined to be suitable ranged from 0.2 to 3.8 ppm. The suitable material of five of these holes (out of a total of 36 which were originally considered to have suitable overburden material) had average boron concentrations of 3.0 ppm or greater.

The DSL/OSM drillhole data included boron analysis, but the analysis in this case was conducted on a saturated water extract instead of the 1:2 soil:water extract as was done on the Montco soil and overburden samples. Regarding the DSL/OSM overburden data, boron concentrations of all samples analyzed were below 1.0 ppm, and the vast majority of samples were well below that figure. Branson (1976), as cited in Gough and others (1979), has reported that the maximum tolerances to boron for semitolerant and tolerant crops are 5.0 and 10.0 ppm respectively, as measured by water saturation extracts.

Thus, in the case of overburden data available for review, no change in the original evaluation of suitable overburden for surface revegetation purposes as contained in the draft document is indicated. This is not to say that everything is known about boron as it affects the plants used in reclamation. To our knowledge, very little research has been done or published regarding the tolerances or requirements of native range grasses, forbs, shrubs, and trees relative to boron.

tolerant species. Examples of plant tolerance are: sensitive - most fruits; semitolerant - barley, wheat, oats; tolerant - alfalfa; and very tolerant - wheatgrasses.

The laboratory data collected during 1979-1980 at the Montco site and the 1980 data identified as "Tongue River Project", suggest evidence of high content of boron frequently.

Study of the laboratory data showed that about 25% of the soil and overburden sampling sites had high boron levels. At the Montco site, where more soil test holes were analyzed than at other sites, the data showed frequent high boron content (> 1.0 ppm) within 18 inches of the surface in most cases. High boron levels were found from the surface and as deep as 75 feet. High boron content is often found associated with salinity and sodicity (1), and this criteria seemed to apply somewhat to the Petition area samplings. The highest boron content was associated with soil areas mapped Haver loam, Vonal clay loam, and Tillsworth loam - soils which are tested high in sodium salts. However, several highly saline-sodic soils sampled showed low levels of boron and conversely several soils of low EC's and SAR's, tested high. A comparison of high boron samples showed that a wide range of soil types and textures are involved, from gravelly, sandy loams to clay.

Research in California (1) suggested that high boron was very closely associated with montmorillonite (expanding) clays, presence of gypsum, and high lime content. The Petition area soils showed a universal high lime content, and high boron was found in both gypsiferous and nongypsiferous soils.

RECLAMATION - SOIL HANDLING

Saline mine soils can be reclaimed by leaching excess soluble salts either with irrigation water or surplus rainfall. Water in excess of that needed for evapo-transpiration is required along with adequate internal drainage.

Sodic mine soils can be improved by use of chemical amendments, like gypsum, that will supply calcium for exchange with the adsorbed sodium and in essence convert the sodic condition to a higher salinity level then proceed as with salinity reclamation.

There is no chemical amendment that can be added to render the boron nontoxic. Reclamation can be achieved by using large quantities of leaching water. Without water for irrigation and with limited rainfall conditions found in the Petition area, leaching to remove excess boron may be impractical.

The preferred method in most instances for reclaiming mined land involving high saline-sodic overburden-spoils in the Northern Plains, is by covering or burying the poor quality sodic spoils with suitable soils at sufficient thickness and gradients (6). The reclamation plans involving high salinity-sodicity plus boron, should involve salvage and replacement of the better quality surface soil.

Current mined-land reclamation laws and regulations for Montana are structured to prevent unacceptable materials such as found within the Petition area from being left on the surface after mining. Discussions as made herein regarding high salinity, sodicity, and boron should not be viewed as moot or academic but should contribute

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74 Your comments are noted. The issues of salinity, sodicity, and boron as they relate to the petition area have been addressed in the evaluation document and in responses to many of the preceding comments.

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to good and proper vigilance so that appropriate and desired mined-land reclamation levels might best be achieved.

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Statement for the Tongue River Unsuitability Petition Record

October 28, 1981

Dr. Patrick Jobes
Department of Sociology
Montana State University

The issue of whether major coal development should or should not be permitted in the Birney-Ashland area once again has emerged as the purpose of a public hearing. My purpose is to address this issue in terms of potential social impacts the area is likely to experience if large scale development occurs. I shall attempt to relate these impacts to the diverse groups and communities in the area. My comments are intended to convey my professional judgement and do not represent the views of any employer or organization with which I am affiliated.

75 Since 1971 I have conducted social research in the Birney-Ashland area. Initially my research was based upon analysis of two surveys of households in the area. In addition to survey data, during August and September, 1981, I collected extensive and detailed data on the area through semi-structured interviews. My recent observations, as well as those from the past lead me to conclude that major coal development in the Birney-Ashland area would impose significant negative impacts.

The area is particularly vulnerable to major development for a variety of reasons. Most obvious among these are its small population, relative isolation and agricultural economy base. Furthermore, this area is extremely complex. It has widely differing social groups which generally lack cohesion for solving social problems. As a result of these qualities, a style of life has emerged which probably would be severely disturbed

75 The threshold question is whether cumulative impacts to the hydrology systems would reduce agricultural productivity of the Tongue River valley. If the answer to that question is affirmative, the socioeconomic impacts may be considered. Your comment is noted.

by rapid population increase created by intensive coal mining and energy production.

Development impacts would not be equally experienced by all groups. Some few ranchers and business persons would economically benefit from development. At the other extreme are a large number of persons, particularly Indians and ranchers, who would clearly suffer from a large immigration of outsiders. Social problems would increase, personal satisfaction would probably decrease, and economic benefit would be unlikely for a sizable minority of area residents. The majority of residents would likely experience some benefits in addition to widespread social costs. They probably would find higher and more stable incomes albeit in a socially undesirable situation from their viewpoint. This would particularly occur during the construction phase.

The Ashland-Birney area has little experience in accomodation to major social change. Most area residents have operated under assumptions that each person should be responsible for political action. Consequently, little formal mechanisms have emerged for handling social problems or meeting social needs. This informal organizational style is inadequate for responding to major coal development without extreme difficulty. The provisions for goods and services would be inadequate for an extended period while other forms of social disorganization would be likely to be increased beyond their present levels for even longer.

It is unfortunate that the social consequences of major impacts have to be reintroduced at this point in the decision making process. However, the Environmental Protection Acts of both the United States and the state of Montana call for a careful consideration of potential social impacts as well as physical ones. The primary resistance to development in the study area is indeed founded upon opposition to the anticipated negative

75 social impacts. Consequently, such impacts should receive serious consideration for determining against major coal development in the study area until modifications in the abilities of the community become sufficient to accomodate change without excessive negative impact.

msu
COLLEGE OF AGRICULTURE

DEPARTMENT OF ANIMAL & RANGE SCIENCES
MONTANA STATE UNIVERSITY BOZEMAN 59717

October 29, 1981

Ms. Sandy Johnson
Department of State Lands
Capitol Station
Helena, MT 59620

Re: Montco Petition and Powder River Tract Profiles (BLM)

Dear Ms. Johnson:

I have recently reviewed five tract profiles (revised) within the Powder River Management Framework Plan Update. These tracts were identified for further consideration for coal development.

I was quite concerned that these tracts (Northwest Otter Ck., Coal Ck., Cook Mtn. Ashland, and Southwest Otter Ck.) were given consideration for mining. I have investigated reclamation and reclamation success for the past 10 years in a research capacity. My particular concern is potential for reclaimability of mined lands in Montana.

I believe that it would be hard to find five poorer tracts for lease consideration, given their apparent low potential for reclaimability. Given the soil reconstruction ratings for example, of 94 percent poor, and suitability of soil material for reclaimability of 75 percent poor or unsuitable, one would conclude that the BLM criteria for site selection did not include potential for successful reclamation. This is a serious flaw, in my opinion, and a flaw that is unacceptable.

Why would tracts be leased when they have such obviously low potential for successful reclamation? A statement under II D. says that "soils rated poor can be reclaimed" but nowhere is the statement supported by literature which suggests that this can be done or how it would be done. If revegetation is precluded by existing soil conditions, how can mining be allowed? My understanding is that OSM cannot permit mining unless reclaimability is documented. The low reclamation potential for these sites seems to be documented.

The recurring statement regarding OSM's assurance (page 19) that the mining company will establish a diverse, effective and permanent vegetative cover to standards set by DSL, etc. seems to be out of place and perhaps meaningless in the tract profiles. It would be much more important to develop and use relevant criteria in selection of tracts for lease consideration. Rather than proposing tracts with obvious low reclamation potential, and then counting on OSM to reject them, these tracts should not have undergone further consideration. Perhaps there is some unexplained reason for this questionable procedure.

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1 Your comments are noted. These kinds of data are required to be included in all permit applications. Information concerning the BLM data is presented in the response to comment 25 of the oral testimony.

The entire question of reclaimability of lands proposed for mining is one that warrants an extensive non-partisan research effort. It's unfortunate that such an important ecological question must be argued in a courtroom rather than determined by scientific method.

Thank you for the opportunity to offer these comments.

Sincerely,

Brian W. Sindelar

Brian W. Sindelar
Assistant Professor

BWS/cc

Dennis J. Smith
429 E, Spruce
Missoula, Mt. 59801

October 31, 1981

Governor Ted Schwinden
Capitol Station
Helena, Mt. 59601

Dear Governor Schwinden:

I am writing to you to strongly urge you to support the Tongue River strip-mine unsuitability petition sent to the Montana Department of State Lands and to the Federal Office of Surface Mining. Although I am writing as a graduate student at the University in Missoula, I have deep roots to eastern Montana, as my family operates a wheat farm north of Brockton, Montana. I have closely monitored the coal issues of Montana and have become increasingly alarmed at the unfounded coal leasing policies emanating from the Secretary of Interior James Watt.

Having lived on a grain farm most of my life, I am acutely sensitive to the renewable qualities of agriculture, particularly as they conflict with the non-renewable, extractive nature of strip-mining. Having also been involved in the course of the Poplar River Project affecting northeastern Montana, I can certainly sympathize with the concerns of the Tongue River irrigators. 1

I am convinced that strip-mine reclamation causes irreparable damage to groundwater systems, both by disruption of the acquifer system and by leaching contamination. I embrace serious reservations to numerous other aspects of strip-mining in the Tongue River area, such as cumulative environmental and social-economic boom town effects. The Tongue River Railroad issue alone is of monumental significance, having the potential to open up an entire virgin agricultural area to the destruction of strip-mining. This railroad issue is doubly ominous because federal loan guarantees are being pursued for construction.

I want to focus, however, on what I consider to be a key issue, that is NEED. I am alarmed, and to be honest, horrified at Mr. Watt's arrogance in ignoring the coal leasing recommendations of the Powder River Regional Coal Team. Specifically I refer to Mr. Watt's ignoring the regional team's recommendation of 763 million tons, and inflating the figure to 1.5 billion tons. I am told that projections debating this figure completely out of reality to the tune of 2.4 billion tons of

1 Your comment is noted. Please see the additional analyses provided in chapter II.

federal coal. Governor Schwinden, I was reassured to see your formal protest to the Interior Department about this federal abrogation of State input into the federal coal leasing program.

I am particularly concerned about these exaggerated federal coal leasing figures at a time when demand for coal is actually dropping. The efforts to attract foreign market for western coal is clearly evidence to this fact. Although there are many more arguments to be made, I must close by summarizing that agriculture, as a renewable and non-polluting industry, must be protected. This is increasingly more important at a time when federal energy policy has become illogical and irrational. Support the Tongue River unsuitability petition and avoid the tragic and senseless impacts earmarked for the Tongue River area.

Sincerely,

Dennis J. Smith

cc, Gareth Moon, Commissioner, Department of State Lands
James R. Harris, Director, Office of Surface Mining, Reclamation and Enforcement

Forsyth, Montana

October 27, 1981

Dear Sir,

My name is Harold Sprague and I own land and ranch in Rosebud County on the fringes of the unsuitable area of the Montco Mine in the Tongue River Valley.

I fear that the mining will have an adverse effect on our ground-water such as wells and springs.

I believe the arid and semi-arid lands cannot be reclaimed to equal the present productivity. There are too many good farms and ranches along the Tongue River that should not be disrupted by the mining industry or railroad building. 1

The social impact on the small rural town of Ashland will be tremendus and the agriculture people will be hard hit by higher taxes.

A railroad down the Tongue River Valley will split many ranches, seperating livestock frompasture and water. Agriculture is a renewable resource producing food and fiber while coal mining is a one time harvest, resulting in irreversable effects, some probably not even known for a hundred years or more

I hope that you will do all in your power to help us save the Tongue River valley from mining.

Sincerely,

Harold J. Sprague

Harold Sprague

1 Your comment is noted.

October 22, 1981

Mike J. Stevenson
P.O.BOX 518
Birney, MT 59012

Commissioner Gareth Moon
Montana Department of State Lands
Capitol Station
Helena, MT 59601

RE: TONGUE RIVER PETITION EVALUATION DOCUMENT (PED)

Dear Mr. Moon:

As a landowner and resident of Birney, Montana I have supported the efforts of the Northern Plains Resource Council and others to initiate this petition process because I have always felt that there were unanswered questions about mining in this area that needed to be addressed. As an architect I am unfamiliar with many of the issues involved, such as the chemical problems related to stock water, irrigation, groundwater and reclamation, so I will let the experts in those fields decide those issues. What I am very familiar with is energy use, and this is the part of the PED that I would like to address.

1 Let us start on page III-13 para. two that states: "Most coal production in Montana comes from the Powder River Basin and is used by the electrical utilities." The electrical market is one that I deal with every day in my business and we are seeing new buildings using as little as 25% of the electricity that similar buildings might have ten years ago. Besides buildings I am also seeing all other phases of technology that are dependent on electricity achieving similar dramatic reductions. This is begining to have an impact on electrical use, and therefore coal use, in this nation. In 1979 DOE forecast a 7% increase in electrical demand; there was about a 3% increase. In 1980 they were again sticking with 7%; there was about a 1% to 2% actual increase. In the first half of 1981 demand for electricity is pointing to an actual drop in demand for the first time in a long time. Still, as evidenced by Table III-6, page III-12 DOE continues to project regular 7% increases every year for the next 20 years in electrical demand.

We are at the balance point right now between the price of electricity and

1 Your comment is noted.

and the willingness of the consumer to pay for it. This is called "market elasticity" and defies accurate projection. The Electrical Industry is saying, and I think hoping, that we are seeing an isolated burble in their consumption curves while we on the consuming end see this slowdown in consumption as the top of a curve that is going to gently descend from here on out to a certain basic level. The electrical power market is much more dynamic and elastic than Table III-6 with its straight line would indicate. I feel that the projections are grossly over-stating what I see as a flat to possibly declining market for electricity in the next ten to fifteen years.

2 On page III-10, last para. the PED states that production of Montana coal has increased steadily since 1970, and then in the next sentence states 1979 production was 32.4 million tons while 1980 production was 30.0 million tons. 1981 figures will be even less than 1980 figures which is not only not a steady increase, but a steady decline in production. This paragraph needs some revision. When our national economic indicators fall for two quarters in a row they call it a recession. When coal production falls for three years in a row when it is supposed to be having a healthy 22% growth in those three years, according to DOE, it makes me suspicious of their projections. I feel that end-use technology, electrical cost and market elasticity are making permanent adjustments toward a decreased electrical consumption that even DOE will be able to recognize in the years to come.

2 According to the U.S. Department of Energy's Data Report (weekly Coal Report No. 212, October 23, 1981), Montana coal production for the first half of 1981 was 16.5 million tons. This figure exceeds the output for the same period in 1979 (14.0 million tons) and 1980 (13.7 million tons).

There are plenty of other experts in the field projecting electrical use, besides DOE, that are in direct conflict with DOE figures. I feel the projections by the PED must take them into account and point at the very least a middle path of projected electrical consumption. To take figures that have always been historically over-stated and use them in a document as serious as this one is a mockery of the process.

To allow the destruction of thousands of acres of surface land through both strip-mining and the Tongue River Railroad based on exceedingly questionable coal demand figures would be a travesty of good decision-making at best. I would like to move that the entire petition area be designated unsuitable for all surface coal mining operations until such time

as the demand for this particular coal can be conclusively shown to be in evidence. By 1985 we should surely see whether the consumers have simply lost their heads for a few years or whether we are seeing a decided trend to less electrical/coal use. This would have no affect on national coal consumption according to the PED since there is an over-capacity now anyway, and the petition can always be reversed in light of new evidence.

Sincerely,

Mike J. Stevenson, AIA

cc Director James R. Harris, OSM
Governor Ted Schwinden

October [illegible]1, [illegible]

D[illegible],

[illegible] property rights. I think a landowner should be able to do whatever he wants with his own land. I resent Keith Powell, Mary Daniels, [illegible] Gilder or any other person or group telling me what I can or cannot do with my land. At the same time I do defend their right to do whatever they want with their own land. The organizations that these three people represent seem determined to oppose coal mining in Southeastern Montana and to force the rest of us to [illegible] it, then many of their supporters have leased or sold surface rights to [illegible] companies. Two Otter Creek ranchers who have accepted coal money have [illegible] that they hope they never see a shovel full of coal removed from their [illegible] leased.

1 It would be [illegible] landowners in Southeastern Montana were wealthy. [illegible] just sit on our corral fence and admire our [illegible] cows----raise our cattle; breed fine horses; grow hay, grain and kids the way we want under ideal conditions and in splendid privacy. The fact is, for most of us, ranching and farming is a subsistence business, barely profitable with persistence, hard work and a conservative attitude toward the land and [illegible]. It is becoming harder and harder to make a living on the land without [illegible] outside source of income. [illegible] country kids are being forced to leave home and find jobs [illegible]. Ranches and farms [illegible] sub-divided [illegible]. And quite a few landowners are leasing their surface [illegible]. It's [illegible] good rancher [illegible] North Forty [illegible] !

A fortunate few have [illegible] so-called life style [illegible] combine the best of [illegible].

Obviously, the bottom line [illegible] the [illegible] the fewer we are [illegible]

1 Your comment is noted.

can't afford to be altruistic. Coal production could be a great boon to the economy of Rosebud and Powder River Counties and I think most of the citizens of our communities welcome the prospect of this wealth. As one citizen, landowner, tax-payer, I believe coal production and agriculture are compatable. If the coal industry is allowed to bring its business to Southeastern Montana, we can afford to step up the livestock and agriculture industry.

Thank you,

Dorothy Alderson Tarter
Three Mile Creek
Ashland, Montana, 59003
Phone 784-2460

2145 E Egbert - Box 248
Brighton, Colorado
Oct 14, 1981

Department of State Lands
State of Montana
Gareth C. Moon, Commissioner
Dear Sir:

Surely the N.P.R.C. cannot speak for all ranchers in the Tongue River valley area. I think it ridiculous to assume that this land would be irretrievably damaged by strip mining of coal. Others think as I do. McGrath-Hills Coal Week of Oct. 5th says that N.P.R.C. is wrong in claiming that Tongue River Valley land cannot be reclaimed after strip mining of coal.

1 The State of Montana has the right according to law to either refuse or permit mining of coal in a specific area so this costly action of N.P.R.C. is superfluous.

An owner of surface or mineral rights on land in this area should have the right to lease his land for strip coal mining. Knowing full well that the land will be reclaimed.

Environmentalists have played a large part in forcing up the cost of energy for the time being public

Yours very truly,
Mrs Zola R. Jerrett

1 Your comment is noted.

WETA

Western Environmental Trade Association

2301 Colonial Drive Helena, Montana 59601
Phone (406) 443 5541

Don Allen
Montana Power Company
Ed Bartlett
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Earl Muntz
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Aluminum Workers Trades Council AFL CIO
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James P. Sieverson
ASARCO
Nine Smith
Montana Snowmobile Assn Inc
Gene Spilde
Ovando Mont
Norman Starr
Melville Montana
Pat Stuart
Montana Coal Council
Bob Voytoski
Int'l Union of Op Engineers
Local 400 AFL CIO
Jim Williams
Williams Construction Company
Russ Williams
Int'l Brhd of Electrical Workers AFL CIO

Dave Johnston President
Joe Crosswhite President Emeritus
Cecil Williams Vice President
Dennis Shea Secretary Treasurer
Peter V. Jackson

November 2, 1981

Gareth Moon
Department of State Lands
State Capitol
Helena, MT 59624

Dear ~~Gareth~~: Gary

The Western Environmental Trade Association firmly believes that the petition filed by member groups of the Northern Plains Resource Council seeking to declare the Ashland-Birney area unsuitable for mining be rejected.

First, the area contains 3.5 billion tons of strippable coal. Mining this coal will not only furnish Montana and other parts of the nation with needed energy; but provide jobs in an area that has little other economic development. The activity also will expand the area's economic and tax base. Thus, by accepting the petition, WETA believes the Department of State Lands will deny considerable economic potential to an area where development is needed.

Second, allowing mining in the area will provide the State of Montana with considerable coal royalty and severance tax money. In this era of federal budget cutbacks, we do not believe that Montana is in a position to turn down this potential for added income.

Third, we believe that petition was filed by an extreme environmental group with the sole purpose of attempting to stop and/or delay the development. We believe that the data and mining plans to be submitted by the companies involved, along with regulation by your agency, should be sufficient to protect agriculture in the area.

Finally, if the petition is denied, we believe that the petitioners should be required to pay the costs of delay to those companies that will be affected by the petition.

Yours very truly,

Peter

Peter V. Jackson
Executive Director

PVJ/bmo

cc: Steve Elliott
Wesco Resources, Inc., Box 1181, Billings, MT 59103

1 Your comments are noted.

University of Montana
Missoula, Montana 59812

Department of Geology

October 30, 1980

Ms. Sandi Johnson
Montana Department of State Lands
Capitol Station
Helena, Montana 596[illegible]

Dear Ms. Johnson

I am responding to the Tongue River, Montana Petition Evaluation Document prepared by your office. I would specifically like to comment on the surface and groundwater analyses utilized in the document:

1. The Woods (1981) model utilized a post mining water quality which is below the field measured TDS of spoil water in southeastern Montana which has been documented by Van Voast in numerous publications and summarized by the National Research Council (1981, p. 131-136). I believe values suggested by Woessner and others (1981, p. 227) and by Van Voast in Appendix D are conservative values for both spoil water quality and groundwater outflow from a mined area.

2. Leaching tests conducted by Woessner and others (1981, p. 293) showed initial water passing through a leach column had a EC of 10,000 [illegible]mhos. Other researchers have noted a similar response and noted preliminary tests which leached and then dried the test column and then re-wetted it showed high EC readings for the second leachate generated (Van Voast, personnel communication, 1980). The implication of this work is that recharge which occurs to the spoil may contain a TDS concentration which exceeds the modelled TDS by 2 to 3 times. I feel the actual quality and quantity of recharge in the southeastern Montana coal area has not been sufficiently documented. Leach data would suggest higher spoil water TDS values than anticipated may occur under assumed recharge rates.

3. Recharge rates used in modelling efforts to date assume that the recharge rates seen in the last 10 years will be maintained for the next 100 to 1,000 years. Groeneveld and others (1979, p. 149) have reported that post mining landscapes are subject to piping and fracturing when differential settling and spoil erosion occurs. This process, which is in part a result of mining in the winter and including blocks of frozen spoil in the reclaimed area, may provide additional avenues of spoil recharge which can result in an increased mobilization of salts in the spoil and further degradation of spoil water quality. This process would increase the total discharge of the ground water system and increase the TDS of the spoil ground water.

1 The factor (1.5) used by the USGS for spoils leachate [illegible] the premining water quality. Thus, postmining TDS concentrations are 2.5 times the premining values. This 1:2.5 ratio compares with a ratio of 1:3.0 implied by your Logging Creek analysis, and ratios of 1:2.7, 1:2.9, 1:2.4, 1:1.6 and 1:1.8 implied by Van Voast's calculations for specific parts of the petition area (see draft document, p. D-[illegible]).

2 It is true that initial leachates from columns have higher TDS concentrations than do saturated-paste extracts; these extracts seem to simulate one pore-volume of column leachate. The extracts were used because their TDS concentrations more closely resemble those that have thus far been found in mine spoils.

3 DSL and OSM agree that the model makes the assumption that current recharge rates will continue into the future. While this assumption may not be valid, in any predictive model assumptions must be made as to future conditions based on information available at the present time. Please see chapters II and IV of the draft document with regard to piping and recharge rates. See also the revisions in chapter II of this document.

It is true that increased recharge would increase the total groundwater discharge of the system, but there is not evidence that the increased recharge would carry higher TDS concentrations than would any other water in the spoils.

Equal Opportunity in Education and Employment

4. Assessment of the effects and impacts of mining in the petition area has to be viewed in the context of a groundwater time frame, not a life of the mine time frame. Woessner and others (1981, p. 228) presented data on the travel time for ground water from their Logging Creek mine site to the Tongue River. The groundwater travel time from the mine face closest to the Tongue River was 24 years under existing pre-mining hydrologic condition. Assuming the mine spoil resaturated shortly after mining ceased, it would take 159 years for all the 4,100 mg/l TDS spoil water which resulted from the initial spoil resaturation to flow out of the mine area. It is believed that water which would replace the initial groundwater which flowed from the spoil would be only slightly improved in water quality.

4 Based on the calculated groundwater flow rates for the Logging Creek site, a mine stated 120 years from the completion of a Logging Creek Mine in a similar hydrologic setting would contribute high TDS groundwater to the Tongue River. From the start of a mine in the setting similar to the Logging Creek site, using a mine life of 30 years, it would take 30 + 24 years = 54 years before mine spoil water would first reach the Tongue River, then an additional 159 years for the first pore volume of spoil groundwater to discharge to the river, then 159 years more for the second pore volume of spoil water to discharge to the river . . etc. Depending on the recharge rate utilized in a model and the thickness of the spoil vadose zone, the transport of a complete pore volume of recharge water could take a thousand years (Woessner and others, 1981, p. 226; Woessner and others, 1979, p. 460-461).

When the effect of one mine is viewed in the context of hundreds to thousands of years then assessment of cumulative impacts of mining must also be assessed in that time frame.

The decision on the fate of the petition will be one which is a legal and pulitical one. As the cumulative effects and impacts of mining are weighed within the legal and political frame work I sincerely believe that the value of the surface water and ground water resources in the petition area must be assessed. Large scale mining in the Tongue River Valley will effect the quality of the surface and ground water resources, principally resulting in an increase in TDS. Commitment to large scale mining in the region is also a commitment of the effected groundwater resource and possibly the surface water resource to a waste disposal use for hundreds to thousands of years.

I urge you to carefully review the technical literature for the petition area and seek additional outside expertise as required prior to making your decision.

If you have any questions regarding my comments, please contact me.

Sincerely,

William W. Woessner

William W. Woessner, Ph.D., Associate Professor

WWW/lje

4 The draft document addresses that first pore-volume of water, just as you did at Logging Creek. There has been no indication that things would improve with time. The USGS water-quality model assumes, based on your work, that all coal mines will discharge at a steady-state rate for a long time period, and they all will be discharging to streams at some comon but undetermined time in the future. The model simulated this common future time (Woods, 1981). DSL and OSM are assessing all impacts with the concept that impacts will continue for hundreds of years.

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CHAPTER V

ALTERNATIVE ACTIONS

This section provides descriptions and analyses of impacts of the four alternatives considered in this document.

Each alternative is described, followed by an analysis of the probable impacts of implementing that particular alternative. Impacts related to the allegations are considered in the following order: (1) surface-water and ground-water systems; (2) vegetation and soils; and (3) coal resource, and supply and demand for coal. Impacts are identified as either short or long term. Each analysis also includes discussions of short-term versus long-term trade-offs and identifies any irreversible or irretrievable commitments of resources.

Where an alternative was considered but not analyzed, the reasons for dropping the alternative from further consideration are presented.

The following alternatives are analyzed to provide a basis on which decisions on the petition area can be made. Possible decisions include: (1) grant the petition, (2) deny the petition, (3) conditionally designate the petition area as suitable for surface mining, and (4) designate the area as unsuitable for surface mining but suitable for underground mining. The conditional designation option includes designating types or methods of mining, as well as designating only specific portions of the petition area.

A. DESIGNATE THE ENTIRE PETITION AREA AS UNSUITABLE FOR ALL SURFACE COAL MINING OPERATIONS

Under this alternative, the Director of the Office of Surface Mining (OSM) and the Commissioner of the Montana Department of State Lands (DSL) would find that, on the basis of evaluations of the allegations of the petition and the recommendation of the Bureau of Land Management (BLM), either (1) that the mandatory criteria of Section 522(a)(2) of the Surface Mining Control and Reclamation Act (SMCRA) and Section 82-4-228(2)(a) of the Montana Strip and Underground Mine Reclamation Act (SUMRA) have been met, or (2) that under the criteria of Section 522(a)(3)(C) of SMCRA and Section 82-4-228(2)(b)(iii) of SUMRA, other important resources and values in the petition area should preclude surface coal mining operations.

Implementation of this alternative would not allow any new surface coal mining operations other than those for which substantial legal and financial commitments existed in the operations before January 4, 1977 within the petition area nor would it allow any new Federal coal leasing for surface mining operations unless such designation is terminated by petition. Extraction of about 3.484 billion tons of recoverable coal in the petition area for power generation or other uses would be precluded.

In consequence of this designation, there would be no impacts to resources from coal mining activity in the petition area. Vegetation, soils, and surface- and ground-water systems would remain essentially in their present condition, provided

that present land use and management patterns remained constant. No damage from mining would occur to agricultural lands within and downstream of the petition area. Under this alternative, mine activity in the petition area would cause little change to the existing levels of air quality, community services, socioeconomic conditions, wildlife, recreation, transportation, esthetics, and cultural resources.

No Federal coal has been leased within the petition area. At least half of the petition area coal is privately owned; much of this fee coal has been leased. The State of Montana also owns coal in the area, some of which has been leased. Nine companies have surface or coal leases in the area that would be affected if the petition is granted.

Under this option, the Coal Creek mine would be prevented from expanding to areas not already permitted unless it can establish that it made substantial legal and financial commitments to such an expansion before January 4, 1977. Montco has a mine permit application pending with the State of Montana. This proposed 12-million-ton-per-year operation, between Ashland and Birney, Montana, would not be able to proceed if the petition were granted in its entirety. Also, the proposed Tongue River Railroad may be adversely affected; without additional active mines, the need for the railroad could be reduced, and construction could be delayed.

Five tracts of Federal coal within the petition area are being considered for leasing in the 1982 Powder River lease sale. If the entire petition area were determined to be unsuitable, a maximum of 621 million tons of Federal coal would be removed from this sale. In order to make up this 621-million-ton deficit, the Department of the Interior might lease additional coal from the Gillette and Highlight Review areas in Wyoming. Because the current leasing target set by the Department of the Interior already includes coal from these areas, such additional leasing could transfer major impacts not previously anticipated to that coal-producing region of Wyoming.

As stated in chapter III of the draft document, the national cost of meeting the 1995 coal demand under a limited leasing scenario could increase by just over $100 million (1978 constant dollars) if the petition area were removed from production.

National coal consumption should not (within the foreseeable future) be limited by supply constraints caused by designating the petition area as unsuitable for mining. The Department of Energy (1980) reported that the coal industry was then producing only 87.9 percent of the existing capacity. All the above impacts of a total designation are long term, and there are no irreversible or irretrievable commitments. The possibility of terminating, by petition, such designation (based on development of new data, technology, or reclamation techniques), prevents the coal from being irreversibly lost.

B. DESIGNATE NONE OF THE PETITION AREA AS UNSUITABLE FOR SURFACE COAL MINING OPERATIONS

Under this alternative, the Director (OSM) and the Commissioner (DSL) would find insufficient cause to designate any of the petition area as unsuitable for surface coal mining operations. Selection of this alternative would not imply

approval of surface coal mining operations within the petition area. Such approval can only be given after a mining company has submitted a mining and reclamation plan to the appropriate regulatory authority demonstrating that the proposed operation would comply with all applicable laws and regulations. In addition to the review of any such plan for compliance with SMCRA and SUMRA, OSM and DSL would also undertake an appropriate environmental review in compliance with the National Environmental Policy Act (NEPA) and the Montana Environmental Policy Act (MEPA). The review would consider comments and recommendations from the surface-managing State and Federal agencies, as well as comments from all segments of the public. Stipulations resolving any identified conflicts or adverse impacts could be added as conditions of mine plan permit approval.

An analysis of the no designation alternative included consideration of the maximum mining potential both within and upstream from the petition area based on currently estimated recoverable coal resources and current mining technology. There is one 75,000-ton-per-year mine in the petition area--Coal Creek. In addition, Montco has filed an application with the DSL for a proposed mine on approximately 1,280 acres of State-leased lands and on approximately 8,920 acres of privately leased lands. This mine plan projects peak production of 12 million tons per year for a total of 186 million tons. The decision on this application is pending.

Under the no designation option, if all minable coal were recovered, there would be a slight irreversible, long-term reduction in infiltration and recharge due to the disturbance of up to 1,060 acres of clinker in the petition area. The resulting increase in surface runoff would probably not have an important effect on the surface-water system.

Impacts of a decision not to designate cannot be assessed, because the level of mining, if any, cannot be predicted. However, the water quality impacts of mining could be variable, long term, and irreversible. The analyses indicate that the shallow Tongue River Member aquifers that would be directly affected by, or down-gradient from, mining would have the greatest increase in total dissolved solids (TDS) due to mining. Water quality in these aquifers, would not decrease materially for livestock use.

The water supply that might have to be replaced due to damage by mining would probably have to be obtained from deeper sources, possibly below the Lebo Shale Member. (See discussion of water supplies in chapter II.) Completing wells into the deeper aquifers would be more expensive due to increased drilling and pumping depth and increased difficulty of drilling and casing through the spoil and would increase pumping and maintenance costs.

Alluvial ground waters were predicted to have the next greatest increase in TDS as a result of mining. The salinity hazard of the alluvial waters for irrigation use in both drainages would remain high or would be increased to a very high level after mining. The Otter Creek alluvial water quality would not materially decrease for livestock use after mining. The Tongue River alluvial waters would remain very satisfactory for livestock use.

Mining under the worst-case mining scenario (table II-4) could increase TDS levels in the Tongue River water to the point that its use for irrigation would be precluded during August. TDS levels in the Otter Creek surface waters could increase enough to curtail or preclude current irrigated agricultural practices.

Since, under this alternative, mining activity is possible, the long-term impacts to soils would include destruction of the soil profiles, loss of soil structure, alteration of pore space, compaction, reduced organic content, and reduction or loss of the viability of native plant propagules because of disturbance or burial in stockpiles.

Soils on reclaimed lands might be less resilient to disturbances than those on undisturbed native range sites; therefore, they could be more susceptible to improper management practices for some unknown period of time after mining and initial reclamation occur.

The existing vegetation in those areas underlain by coal and on lands needed for associated facilities would be destroyed by mining. Revegetation of disturbed areas to the standards required by SUMRA and SMCRA appears to be possible. However, the vegetative pattern and diversity would probably change for the long term. The technology for long-term reestablishment of certain shrubs and trees, such as ponderosa pine, which are important in the petition area is not, at present, entirely defined and would require detailed evaluation at the mine-plan stage.

Other impacts of mining in the petition area, such as air quality, socio-economic conditions, wildlife, recreation, and transportation impacts, are documented in:

1. U.S. Geological Survey and Montana Department of State Lands, 1979, Draft environmental impact statement, regional analysis--Northern Powder River Basin Coal, Montana.

2. U.S. Forest Service, 1978, Environmental statement land management plan--Draft Ashland plan: Missoula, Montana, U.S. Department of Agriculture, Forest Service, ADM-DES-01-08-79-01, 300 p. plus maps.

3. Powder River County Planning Board, 1981, Update--Comprehensive plan: Powder River County.

4. Rosebud County Planning Board, 1979, Planning data book and comprehensive plan: Rosebud County.

5. Rosebud County Planning Board, 1980, Planning data book and comprehensive plan--update: Rosebud County.

6. (U.S.) Bureau of Land Management, 1981a, Powder River--Tract profile, Ashland (Decker-Birney) tract, Montana: Billings and Miles City, Montana, 42 p.

7. (U.S.) Bureau of Land Management, 1981b, Powder River--Tract profile, Ashland (Coalwood) tract, Montana: Billings and Miles City, Montana, 43 p.

8. (U.S.) Bureau of Land Management, 1981c, Powder River--Tract profile, Southwest Otter Creek tract, Montana: Billings and Miles City, Montana, 43 p.

9. (U.S.) Bureau of Land Management, 1981d, Powder River--Tract profile, Northwest Otter Creek tract, Montana: Billings and Miles City, Montana, 42 p.

10. (U.S.) Bureau of Land Management, 1981e, Final environmental impact statement, Powder River regional coal: prepared by the Wyoming State Office in cooperation with the U.S. Forest Service and the U.S. Geological Survey.

Other environmental impact statements documenting impacts typical of mining in southeastern Montana are:

1. U.S. Geological Survey and Montana Department of State Lands, 1977, Proposed plan of mining and reclamation, East Decker and North Extension mines, Decker Coal Company, Big Horn County, Montana, final environmental impact statement: v. I, FES 77-20.

2. Montana Department of State Lands, 1977, Final environmental impact statement on the proposed expansion of Western Energy Company's Rosebud mine into areas A and E: Helena, Montana.

3. Montana Department of State Lands, 1979, Final environmental impact statement on the proposed mining and reclamation plan for Westmoreland Resources, Inc.'s Absaloka mine, Bighorn County, Montana: Helena, Montana.

4. Montana Department of State Lands, 1980, Draft environmental impact statement on the proposed mining and reclamation plan for the West Decker mine extension, Bighorn County, Montana: Helena, Montana.

5. Montana Department of Natural Resources and Conservation, 1974, Draft environmental impact statement on the Colstrip electric generating Units 3 and 4, 500-kilovolt transmission lines, and associated facilities: Helena, Montana.

In general, the local and State economies would be affected by development associated with production of coal within the petition area. The expanded tax base, increased employment, and associated revenues might be a major positive impact on the area. This impact might be balanced, however, by the costs of providing increased services in support of growth in the area. DSL is currently conducting an in-depth analysis for an environmental impact statement on the proposed Montco mine. The Interstate Commerce Commission is conducting a similar analysis of the proposed Tongue River Railroad. The potential environmental impacts of any further mining in the petition area would also be studied in conjunction with proposals for such mining.

Under this alternative there would be no present or future impacts on the coal resources, or on the supply and demand for coal, as mining and leasing would not be prohibited in the area.

C. CONDITIONAL DESIGNATION OF UNSUITABILITY

Designate as unsuitable for all surface mining operations certain parts of the petition area.--Under this alternative, the Director (OSM) and the Commissioner (DSL) would find that certain parts of the petition area are unsuitable for surface coal mining operations. Designation of acceptable acreage levels without identifying specific tracts is technically unsupportable based on DSL's and OSM's studies and data. Furthermore, the designation statutes require designation of specific areas and types of mining as unsuitable. They do not contemplate designation of levels of mining.

The probable impacts of this alternative could be similar to those of alternative A with respect to the area designated unsuitable and similar to those of alternative B with respect to the area not designated. The DSL/OSM evaluation of the petition, however, has not demonstrated, for any particular area, either that reclamation would be technically or economically infeasible or that mining would result in a substantial reduction of long-range productivity of water supply or food or fiber products.

Designate methods or types of mining operations that would be unsuitable within the petition area.--No such methods or types of mining were identified.

D. DESIGNATE THE ENTIRE PETITION AREA AS UNSUITABLE FOR SURFACE MINING, BUT ALLOW UNDERGROUND MINING

Under this alternative, the Director (OSM) and the Commissioner (Montana DSL) would find that the petition area is unsuitable for surface coal mining but might be suitable for underground mining. Available information indicates that no coal reserves in the petition area are known to be recoverable or marketable using underground methods.

CHAPTER VI

ADDITIONAL REFERENCES

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